

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

MONTHLY BULLETIN
OF AGRICULTURAL INTELLIGENCE
AND PLANT DISEASES

AR IV - NUMBER 9

SEPTEMBER 1913



* ROME: PRINTING OFFICE OF THE INSTITUTE. 1913. * * * *

In quoting articles, please mention this BULLETIN.

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The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Present Condition of Agricultural Meteorology in Brazil

by

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Before the formation of the Ministry of Agriculture, the Brazilian government possessed no meteorological organization. The State of Paulo had, however, already arranged for its own purposes a service which was in regular working. One of the first concerns of the first minister of Agriculture was to reform the old observatory and to arrange for it to organize a meteorological service capable of meeting agricultural needs. The new establishment started its work at the beginning of 1910, and the first year's efforts were largely of a preparatory nature, and the proper working began in the following year; its activities are steadily developing, and will continue to do so till a sufficient network of stations covers the three million square miles of the national territory.

The object of this service is twofold: its principal aim is to provide the data required by agriculture, while the second is to carry out as many scientific determinations of general interest as are compatible with the resources of the service without in any way interfering with the work of direct utility. This is the spirit in which the organization has been conceived and is developing.

Each territory of the State forms an agricultural district and likewise constitutes a meteorological district. In each district which reaches a number of stations corresponding to one per 8000 sq. miles, with a minimum of ten altogether, a Central Station will be founded; this will undertake the direct control of the stations in the district, and will send the required figures to the National Observatory at Rio de Janeiro, which directs the whole. Till this stage is reached, the National Observatory exercises direct control over the stations.

State Governments which wish to collaborate with the Federal Government for the development of agricultural meteorology are entitled to a subvention, consisting first in the free furnishing of the instruments required, and later in the payment of half the expenses of upkeep. To have the right to this assistance, the Governments must undertake to have the observations made according to the rules drawn up for the federal stations, and to allow their services to be inspected by the officials of the National Observatory appointed by the Director. So far, only the services of S. Paulo and Rio Grande do Sul have been admitted under these conditions, but Minas Geraes is at present equipping its own, and Bahia proposes to do so.

This liberal disposition of the Federal Government reduces the difficulties encountered by the National Observatory in setting up numerous stations in the interior of so vast a country as Brazil. Till recently the positions of the observation points were chosen more or less by chance on the coast or along means of communication, such as rail ways and navigable rivers. As a result of this, there is a fairly wide belt along the coast in which there are a sufficient number of stations for the climatic conditions to be considered as known. But the vast interior, in places covered with great forests and elsewhere consisting of wide savannahs, is still very little known; it is particularly in these regions, where communication is difficult and there is little chance of finding capable observers, that new stations are required. In this, the local Governments can be of great assistance owing to their knowledge of places and people, which makes easy for them what would be a very difficult task for anyone sent out from the Rio Observatory and not knowing the country.

The number of stations of all classes, including those belonging to subsidized services, is two hundred. For a knowledge of the climate of all parts, sufficiently exact for agricultural requirements in deciding the possibility of introducing new crops or of extending the old ones, at least twice the number are required. It is probable that as soon as the existing difficulties are overcome, persevering efforts will result in this end being reached within a few years.

The stations of the Brazilian service conform strictly to the resolutions adopted by several Meteorological Congresses and combined in the "Codex" published by the International Meteorological Committee.

The central observatories, at present three, are placed in class I; they make hourly observations of all the usual elements, and possess registering instruments of the best types, allowing them to undertake investigations of special subjects, such as the rate of spread of storm evaporation under various conditions, study of the electric potential of the air, etc., etc.

The stations of class II have all the directly-read instruments for determining the usual elements, as well as registering instruments for pressure, temperature, humidity and rainfall.

The stations of class III have no registering instruments; but they make the same observations as those of class II except for duration of sunshine.

The pluviometric stations have only rain-gauges. The observations everywhere made at the international hours: 7 a. m., 2 p. m. and 9 p. m., stations of classes II and III-B. Those of class III record only at 7 a. m. and 9 p. m.

The stations of class III-A, besides the climatological observation at these two hours, make a complete observation at the local time corresponding to Greenwich noon; the stations of class II also do this, and the records are telegraphed to Rio to be used in weather-forecasting.

Though forecasting is a part of the regular function of the service, has not yet been carried very far, as the stations are too few and too irregularly distributed to allow of a reasonable forecast being drawn up; other reason is that true cyclones are unknown in Brazil: although this is a fortunate circumstance, yet it removes the very feature which is most readily forecasted. All the efforts are therefore directed to the climatological side.

As soon as the National Observatory is removed to its new building, will undertake careful and prolonged observations, such as have been hitherto impossible under present arrangements, to wit: evaporation from free surfaces; warming of soils of different kinds, at different depths, under various types of vegetation; continuous determination of the air constant (at present only made sporadically); electric conductivity estimation of the ions in the atmosphere, etc., etc.

As the north-east of Brazil is subject to the scourge of drought, sustained observations are now being carried on as to the amount of rainfall, so as to determine the possibility of introducing dry-farming methods.

Brazil possesses immense regions covered by vegetation, in places forested and in places "campos" or savannah. The verge of the latter has lately been steadily impinging on the territory of the forest. The question is whether this deforestation makes the climate more arid is still undecided, but may be determined in a few years by observations in the limiting zones, under the same conditions of latitude and altitude.

The Upper Uruguay is subject to periodical floods and low waters, the difference in level being more than 30 feet. During droughts, the river is not navigable owing to falls and projecting rocks. The country along the banks is rich, and produces abundance of maté and good building timber, for which the only practicable means of exportation is the river. In the dry season the rivermen build long trains of wood and plank boats on sandbanks then exposed, filling the boats with bales of maté. When the flood comes these float off by themselves, and they are led down the river in lines, reaching Uruguayana in a month or two; when the water is very high they go on as far as Concordia, where the timber and the maté make good prices. The boats are also demolished, planks sold, and the bolts carried up again on horseback to serve the next year.

It not infrequently happens that the main lasting flood is preceded by "repiquetes", or little floods, which do not last. If the riverman mistakes them for the main flood, he runs the risk of having his train ground and break up among the rocks when the water falls. On the other hand, waiting too long for the flood to get well established may mean that the train does not reach a good port before the flood is past as it does not last very long; in this case, also, the cargo would be lost especially seeing that the maté ferments and spoils in a short time under such warm and moist conditions. Consequently the rivermen are always on the look-out for the real flood. This depends on the setting in of the rains in the regions of the headwaters, that is Santa Catharina and Paraná. When the date of this is known with certainty, the flood will be able to be foretold several days in advance.

The same phenomenon occurs in the Amazon region, affecting other products; but it is difficult to get any exact knowledge of the period of rains in the district of the sources, as the upper tributaries occupy a large and sparsely populated area.

This sums up the principal agricultural problems occupying the attention of the Meteorological Service; it is to be hoped that persevering efforts will result in the resolution of these and other problems which will arise, to the great benefit of the country, of which agriculture will long yet be the principal and most fruitful resource.

The Possibility of Using Crude Phosphates (1) and Limes containing Silica as Manures

by

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One of the most important nutrient materials for plants, namely phosphoric acid, occurs in large accumulations in nature only under the form of salts soluble with difficulty, in particular as tri-calcium phosphate. As has long been known, the characteristic mentioned makes these crude phosphates (Rohphosphate) in general unfit for immediate use as manures. It should be remembered, however, that the form of combination of the phosphoric acid is not the only decisive factor in its utilization by plant roots; much more frequently other factors come into play. In this connection the remarkably slight action of many phos-

(1) Undissolved bone meal may to a certain extent be classed with the crude phosphates, but it differs from them so widely in its origin and action, that it is necessarily excluded from the present article.

onites in comparison with that of bone meal will be remembered; experiments carried out by MITSCHERLICH (1) well illustrate this point; comparing 0.4 gm. of P_2O_5 as precipitated tri-calcium phosphate, with equal amount as crude phosphate, he obtained the following results, pressed as increase (+) or decrease (—) in dry matter in the pot without osphatic manure:

Precipitated tri-calcium phosphate . . . +	27.8 ± 2.21 gm.
Crude phosphate	2.6 ± 0.47 gm.

It is not to be wondered at that interested persons are constantly ing, to the detriment of agriculture, to palm off crude phosphates as usable manures, frequently giving them fine names, and quoting the results of experiments with similar substances obtained here and there under special conditions.

In giving an outline of the utilization of crude phosphates as manures, I must, after these preliminary remarks, confine myself to some of the more important points in the action of these substances, utilizing for purpose the most recent literature.

A.

1. Prof. A. N. ENGELHARDT (2) has had remarkably good results on his estate of Batishtchev, in the Government of Smolensk, by the application of finely ground phosphorites of Russian origin. "The Polish phosphorites form an exception, being frequently quite without iron; they resemble the French *crystalline* Beauval phosphorites, which, never finely ground, are hardly assimilable, and require to be made into superphosphates". This restricting statement draws attention to the importance which physical condition has on the possibility of utilization of phosphorites. In the same way TACKE (3) speaks of "weicherdigen Phosphaten" (earthy phosphates), which are much more easily attacked by the soil agents than "felsigen Phosphaten" (stony phosphates). A French phosphate from the chalk, only 30.2 per cent. citrate-soluble, tried by H. SVOBODA (4) on three meadows with sandy loam soil fertilized by rubble; it gave remarkably good results, even in places where better than basic slag. In this case also it seems reasonable to consider that the phosphate has a physical structure specially capable of being broken down.

(1) *Landw. Jahrbücher*, 1912, p. 412. PRIANISHNIKOV reports similar results (*Landw. Stat.*, 1902, p. 122 et seq.): it is further to be mentioned that the same investigator found precipitated aluminium phosphate also utilizable by plants, and GUILLEN (*Journal d'agriculture pratique*, 1907, I, p. 171) reckons that a similar preparation has given as good results as superphosphate.

(2) *Zeitschrift für das landw. Versuchswesen in Oesterreich*, Vol. 3, 1900, p. 631.

(3) *Hannov. Land- und Forstwirtschaftliche Zeitung*, 1909, p. 414.

(4) *Zeitschrift für das landw. Versuchswesen in Oesterreich*, Vol. 11, 1908 p. 733.

Further experiments in the same direction were those of TH. PRYER and E. BLANCHE (1) with pot cultures, using sand; they found that Estramadura phosphates had no action on the growth of oats or lupine while phosphorites from Kasan and Smolensk (used in another year, but under precisely similar conditions) produced a decided increase. Last may be quoted manuring experiments made by H. G. SÖDERBAUM (2); the increase of yield produced by a Tunisian phosphate was 22.2 per cent. of that produced by superphosphate, while the so-called "Bernard phosphate", prepared by calcination of Belgian crude phosphates, was absolutely without effect.

II. "In all cases earthy crude phosphates (Algerian, Gafsa, etc.) do better than basic slag on sour peatmoor (Hochmoor) soils and then similar to them. On sour mineral soils rich in humus, reclaimed from heath or long manured with heath turves (Heideplaggenstreu), basic slag may be replaced by the crude phosphates mentioned, provided the amount of free acid in cultivated land (reckoned on the dry matter) is about 0.05 per cent., or in meadow land 0.10 per cent.; but the dressing of phosphoric acid must be one-fifth greater than in the basic slag". The quotation from the article by BR. TACKE already mentioned, brings out very clearly the second important point, namely the significance of the soil in the action of crude phosphates. Comparatively good results were obtained by ARTHUR RINDELL (3) on a well humified moor soil to which loam had been applied; Algerian phosphates gave an increased yield equal to 60 per cent. of that given by basic slag in the case of cereals (reckoning the general average of grain and straw) and 91 per cent. in the case of a seeds-ley. Quite different results were obtained in experiments by W. SCHNEIDEWIND and D. MEYER (4) on a humous loess-loam soil containing about 1 per cent. of lime; here crude phosphates showed results on oats grown for the first two years, and only began to take effect in the following five years, giving an increased yield of various crops up to 36 per cent. of that of basic slag. Remarkably irregular results are recorded by TH. REMY (5) from manuring with Algerian phosphates: in some cases the effect was considerable, in others almost none; considering that there were no controls, this should be attributed primarily to differences in the soil. But these differences are not confined to soils showing different degrees of acidity, for the researches of K. GEDROIZ (6) show that they occur in soils with completely neutral

(1) *Landw. Versuchsstationen*, Vol. 77, 1912, p. 217.

(2) *Meddelande N. 56 från Centralanstalten för Försöksväsendet på Bruksområdet*, Stockholm 1912. — Abstract to *Centralblatt f. Agric. Chemie*, 1912, p. 447.

(3) *Finska Mosskulturför.*, 1906-1907, 3, p. 182; *Ibid.*, 1910, p. 101. Abstracts in *resbericht für Agrikultur-Chemie*, 1908, p. 182. and *Centralblatt für Agrikultur-Chemie*, 1910, p. 593.

(4) *Landw. Jahrbücher*, Vol. 39, III, 1910 p. 236.

(5) *Landw. Jahrbücher*, Vol. 40, 1911, p. 560.

(6) *Russisches Journal f. experim. Landw.*, Vol. 12, 1911, pp. 539 and 816.

action. He refers it to the unsaturated condition of the soil as regards bases.

In considering the soil, the part played by *bacteria* in bringing crude phosphates into solution should not be forgotten. J. STOKLASA (1) even attributes the most important action to them; but in any case the investigations reported by E. KRÖBER (2), by W. G. SACKETT, A. I. PATTEN and CH. W. BROWN (3), by S. A. SEVERIN (4), and others, leave no doubt that soil organisms of various kinds induce liberation of phosphates forming acids, and very likely also directly. Here again, as far as comparisons have been made, the earthy phosphates have shown themselves comparatively readily assimilable.

III. D. PRIANISHNIKOV (5), mentioning occasional references in various literature, was the first to emphasize the fact that different plants show decidedly different powers of dissolving phosphorites. He estimates the power of utilizing the phosphoric acid of phosphorites, as compared with that of monocalcium phosphate, at 0 to 10 per cent. for cereals, and 10 per cent. for buckwheat and lupins. In further work (6) was led to the conclusion that "the differences in the power of solubilization of different plants are of more importance than differences in the properties of the crude phosphates". P. KOSSOVITCH (7) extends this point stating that according to his investigations not only is the utilization of slightly soluble phosphates very unequal with different plants, but that one and the same plant behaves differently as regards the power of solubilizing phosphoric acid of different origins. Further experiments on this point by those of TH. REMY (*loc. cit.*) and A. BAGULEY (8). Remy got good results with Algerian phosphates on oats, peas and especially blue lupins, but not on rye and spring barley. Baguley was investigating the question (not strictly within the scope of this article) of the effect of fixation on the availability to plants of ferric and calcium phosphates, found differences between oats on the one hand and peas and sweetclover on the other.

The explanation of these phenomena—whether the plant roots bring varying amounts of organic acids to bear, besides carbon dioxide, or

(1) *Centralblatt für Bakteriologie* II, Vol. 29, 1911, p. 385.

(2) *Journal für Landwirtschaft*, Vol. 57, 1909, p. 5.

(3) *Centralblatt für Bakteriologie* II, Vol. 20, 1908, p. 688.

(4) *Ibid.*, Vol. 32, 1912, p. 498. — In a first series of experiments (*Ibid.*, Vol. 28, p. 561) different results were obtained.

(5) *Landw. Versuchsstationen*, Vol. 56, 1902, p. 107. — The same author gives information on the influence of the soil on the solubility of crude phosphates, which should be read to section II.

(6) *Landw. Versuchsstationen*, Vol. 65, 1907, p. 23.

(7) *Russisches Journal für experiment. Landwirtschaft*, Vol. 10, 1903, p. 839.

(8) *Journal of Agricultural Science*, Vol. IV, 1912, Part 3, p. 313. Abstract in *Central*.

für Agrik.-Chemie, Vol. 41, 1912, p. 675. (Also No. 638, B April 1912. *Ed.*)

whether the different degree of development of the root system plays some part—cannot be discussed here (1).

IV. The merit of having first discovered the dissolving action of *physiologically acid salts* (2), especially ammonium sulphate, on crude phosphates belongs also to PRIANISHNIKOV (*loc. cit.*). E. KRÖNER (*loc. cit.*) has carried this one step further, by showing that nitric acid is produced during the nitrification of ammonia or indirectly in the nitrification of organic compounds.

Physiologically basic salts should naturally have the opposite effect; in this connection, it has been shown many times for bone meal that the addition of sodium nitrate or calcium carbonate (which directly stops the action of acids) greatly lowers the utilization by plants of the contained phosphoric acid, or even completely prevents it. A demonstration experiment very readily carried out is the following: sand-cultures are treated with bone meal and potassium sulphate, and the nitrogenous manuring is given as 1) ammonium sulphate, 2) ammonium sulphate and calcium carbonate, 3) sodium nitrate. The result is that only the plant with the first nitrogenous manuring show luxuriant growth, while the others show evident lack of phosphates (3).

Considering these four points together, we may conclude that crude phosphates may be useful manures under particular conditions and for special purposes, but that much caution should be exercised in using certain substances of this nature recently placed on the market, at least till their value has been ascertained without any possibility of doubt.

B.

There is a general opinion, at any rate as far as one may judge from German literature, that quicklime containing fairly considerable quantities of soluble (hydrated) silicic acid is unsuitable as a manure, the idea being that its application will lead to the formation of hard cement-like lumps in the soil.

H. IMMENDORFF (4) has shown that such fears are quite unfounded; this conclusion has been reached as the result of exhaustive experiment partly carried out by his pupil MEYER at Bexten and only published

(1) See also the article by TH. PFEIFFER and E. BLANCK referred to above.

(2) This is the term adopted by AD. MAYER for salts whose base is absorbed by plants more readily than the acid. Conversely we may speak of "physiologically basic salts" such as sodium nitrate.

(3) As sources for the facts given in section IV, the following may be mentioned: C. VON SEELHORST, *Journ. f. Landw.*, Vol. 51, 1903, p. 212; A. RINDELL, *l. c.*; O. B. TCHER, *Landw. Versuchsstat.*, Vol. 65, 1907, p. 407; H. G. SÖDERBAUM, *Ibid.*, Vol. 68, 1910, p. 433; J. SEBELIEN (abstract by the author), *Centralblatt f. Agric.-Chemie*, Vol. 38, 1910, p. 801; D. PRIANISHNIKOV, *Landw. Versuchsstat.*, Vol. 75, 1911, p. 357.

(4) *Mitteil. d. Deutsch. Landw. Ges.*, 1911, p. 514; *Landw. Versuchsstat.*, Vol. 79-80, 1911, p. 891.

extenso later. "Limes rich in silica (1) behave exactly like silica-lime from marble as regards their loosening effect on the soil, provided the soil is given the same amount of active material ($\text{CaO} + \text{MgO}$) and the surtate or formation of lumps in the soil are impossible in all limes, and even with cement, provided the spreading is properly ried out". Immendorff is even inclined to consider the presence of the hydrated silica in lime as advantageous, as this may increase the power of zeolitic material (mixtures of gels), and so increase the absorp- power of the soil. At any rate limes containing silica need no per be excluded for manurial purposes.

Recent Progress in Belgian Horticulture

by

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The quinquennial international horticultural show, held at Ghent (2) in April and May of the present year, which has been fully described in press, has once more given a striking demonstration of the importance which horticulture has attained in Belgium.

The buildings in which this exhibition was arranged comprised a room covering 17 000 sq. yds. and a hothouse 7000 sq. yds. in area. In the showroom one exhibitor, competing for a prize offered, collected over five hundred species and varieties of plants which had been shown in the various exhibitions at Ghent from 1808 onwards. This is a characteristic detail, showing how horticulture, after ceasing to be a hobby of people favoured by fortune, has taken up all possible new ways to feed the trade during the hundred years that have passed.

The Belgian horticultural industry is specially developed in Flanders, its capital, Ghent, has retained the monopoly of the export trade in horticultural products. Ghent and its suburbs, with several communes further out, have more than a thousand horticultural establishments, whose size varies from a few rods to 25 or 30 acres. It has also developed rapidly in the last twenty years round Brussels and Bruges, as well as to some extent in other places, particularly Antwerp and Liège.

(1) Including a Portland cement containing 19.51 per cent. of silica soluble in hydrochloric acid.

(2) The Ghent horticultural shows are organized by the Royal Agricultural and Horticultural Society, founded in 1808. The first international show was held in March 1837. At that time the quinquennial international shows, as well as a large number of local shows and competitions, have been held regularly.

According to the register of horticultural establishments and holdings conforming to the regulations of the Berne Phylloxera Convention and consequently subject to the inspection required by this international act, Belgium has over 1800 horticultural concerns (1) distributed as follows in the different provinces of the kingdom :

	Total	Percentage
Antwerp	98	5.3
Brabant	139	7.4
West Flanders	173	9.2
East Flanders	1 019	54.5
Hainaut	129	6.5
Liège	79	4.2
Limbourg	112	6.0
Luxemburg	51	2.7
Namur	78	4.2

Thus Ghent and its neighbourhood account for more than half horticultural establishments in the country.

Germany comes first as a consumer of Belgian horticultural produce; then follow, in order of importance, France, the United States, America, England, Holland, Russia, Austria-Hungary, Switzerland, Scandinavian countries, etc.

According to certain estimates, the total value of the exports of horticultural plants from Belgium in 1912 was 14 million francs (£550 000) in the same year the exportation from Ghent and its neighbourhood alone was over 10 million francs (nearly £400 000).

We may now consider the various species and varieties of plants which figure in this trade. Their number tends to diminish, first because amateurs are disappearing in Belgium and in other countries and secondly because the demands of trade are incompatible with profitable growing of a large number of different genera.

To supply their customers, the traders require in particular such plants easy to grow, and this in itself explains why the growers limit themselves to a small number of varieties.

One of the dominant plants in Ghent horticulture is *Azalea indica* of which the Americans are large buyers. The growers endeavour to produce good forcing plants, flowering at Easter or Christmas, two seasons during which flowering plants are in great demand in the United States. *A. mollis*, *A. pontica* and hybrids of these, which were rather neglected lately, are now coming into fashion again.

After azaleas come varieties of *Rhododendron ponticum*. The varieties grown are those which bud well and easily as small plants, or as

(1) In this number are included nurseries for fruit and forest trees, and even holdings on which market-garden crops are grown. On the other hand some true horticultural concerns do not appear.

varieties suitable for the continental climate of Europe or for the sometimes excessive climate of North America.

Palms and laurels are also very largely grown. Laurels are at present undergoing great changes in shape. Among palms, which are produced in great quantities about Ghent, mention must be made of *Kentia forsteriana*, *K. Balmoreana* and species of *Cocos* and *Phoenix*. Other genera are almost given up.

Tuberous begonias (as bulbs) are grown in great quantities, indeed sometimes in excess, as in some years the crop no longer pays. Begonia growing is especially practised by small holders or beginners. The growing of araucarias (*A. excelsa* and *A. glauca*) is also of considerable importance.

Among the other most largely grown plants may be mentioned *pidistra*, *Dracaena*, *Croton*, *Maranta*, certain Bromeliaceae and Aroideae, *Crus sinensis* and various Australian plants. Camellias are coming into favour again. Owing to the commercial conditions already referred to the number of varieties of these plants is constantly diminishing, while the individual plants are constantly being perfected.

In the establishments round Bruges palms and laurels, and orchids cut flowers, are specially taken up.

About Brussels, the plants are grown specially to provide cut flowers: lilac is the great feature, and is largely flowered in winter. Sometimes there is a glut, with consequent fall of prices. Lilacs are beginning to be forced growing in the ground on privet stocks. Forcing is also used for roses; the best forcing varieties are: Frau Carl Schick, Mistress John Laing, Caroline Tertout, Lyon, Mme. Abel Metenay, Prince of Bulgaria. After lilacs and roses come chrysanthemums, produced chiefly from September to January. Then, still of considerable, though secondary, value, come *Calla aethiopica*, wallflower, *Lilium candidum*, *L. longiflorum*, *L. speciosum*, gladiolus, ixias, etc., and lastly any quantity of plants grown in the open.

American carnations are taking more and more hold in Belgium. At the international show the Belgian ones were well able to compete with those from other countries.

Among the plants grown in Belgium, special mention should be made of orchids. They are produced about Brussels and Ghent, at Bruges and elsewhere. The demand for them keeps on growing; the Belgian production of these cut flowers is at present the largest in Europe. Besides this, amateurs and professionals are engaged in obtaining new varieties from seed and hybridizing; some of those already obtained surpass all imported varieties in beauty and rich colouring.

The slowness of raising orchids in the Belgian climate and the enormous quantity of plants required by the trade necessitate continual imports from their countries of origin. The big firms communicate with collectors exploring the tropical regions of America, Asia, Africa and some parts of Oceania. Early on, Belgium began to organize botanical exploring expeditions with a view to procur-

ment to Lindon; later, Van Houtte became celebrated in this line. At present the chief work of the collectors is to procure and send off large quantities of the known species, especially those suitable for flower-growing on a large scale.

As can be seen from what has been said, Belgian horticultural production tends to become specialized, and as this specialization goes on, another economic phenomenon appears, at any rate with reference to Ghent: this is that while the majority of the firms raise plants, and only exceptionally deal abroad, frequently even not at all, other firms are almost entirely occupied with the export trade, and do very little raising (1).

A new organization of horticultural instruction, considering commercial necessities, will in the future facilitate the relations with other countries and give great encouragement to this part of the work, which will become more and more dominant.

Owing to the specialization in the plants grown, the arrangement of the establishments and the construction and heating of the houses have undergone great changes, constituting decided economic and technical progress. In the old establishments small houses were numerous, as each had to be used for different plants. For some years, most of the houses put up have been large, even up to an acre in area. These buildings offer great advantages for both labour and heating.

The inevitable rise of wages also obliges the growers to economize labour as much as possible, and to devise means for replacing it by mechanical contrivances, at any rate for heavy work, such as watering.

The construction of the houses has been simplified and improved, the choice of materials is more careful. Small panes of glass are given up, and only larger ones used. But the question of heating is the one that has most largely occupied the growers, and it continues to do so as in spite of the experience gained it cannot yet be said that there is a general agreement on all points of the problem. Originally hot-air heating was general, and it is still used by vine-growers and the small horticulturists. In larger concerns steam heating is preferred. The preference is based, especially for the super-heated steam system, on the better drawing of the fire, which allows a cheaper fuel to be used.

Steam heating is, however, not advisable in all cases, especially in cold houses where the heating is intermittent and the temperature must not rise above a certain point. There are plants, such as orchids which require a fairly moist atmosphere; for these hot-pipe heating is preferred.

(1) There is in Belgium only a single society which undertakes the sale of the produce of its members; this is the *Syndicat horticole, viticole et maraîcher*, a very prosperous society, which has an auction at Brussels for the public sale of flowers grown by its members, as well as by others.

the means employed to maintain private enterprise, which has been very energetic in the horticultural line in Belgium, and to safeguard the interests of the horticultural industry.

Belgium is with truth said to be the classical ground of societies of all kinds. There are certainly more than 300 societies occupied in some manner with gardening or horticulture. It was one of these societies, the Royal Agricultural and Botanical Society of Ghent (1), which in 1808, as already stated, organized the first known exhibition of plants of flowers. For many years the show organized by the Societies for the Encouragement of Horticulture (Sociétés d'émulation horticole), and more recently the horticultural meetings of Ghent and Brussels, have been a great stimulus to progress, and by spreading the taste for flowers and plants have helped to increase the wealth of the country.

For some time Belgium has had the advantage of horticultural instruction. The foundation of the school at Ghent by Van Houtte in 1849, and almost simultaneously of that at the De Bavay establishment at Ilwode, marks a considerable advance in the history of Belgian horticulture. At the present time horticultural instruction suitable for growers is given in all the centres of production.

Belgium possesses a State Botanic Garden, in which horticulturist and amateur can find collections of hothouse and outdoor plants for study.

Since 1880, the defence of the commercial interest has been under the energetic and enlightened guidance of the Belgian Chamber of Horticulture (Chambre syndicale des horticulteurs belges), whose offices are at Ghent.

With the idea of giving to national horticulture an official recognition of its importance, the Government instituted in 1908 a Superior Council of Horticulture, composed of 29 members representing the various branches of the horticultural industry; its mission is to give advice on questions submitted to it by the Government or by its members.

In the same year, the Government created a service specially designated to study horticultural questions, and in 1911 this service became part of the general administration of the country, with the title "Horticultural Office". With the assistance of a corps of employees titled "State horticultural advisers", appointed at the end of 1909, the Horticultural Office has already undertaken work of various kinds, in which good results are to be expected.

Lastly, the Government founded as long ago as 1892, in connection with the State Agricultural Institute at Gembloux, a service of research

(1) The title of « Royal » was bestowed on the society in 1818 by King William of the Netherlands.

and consultation on the damage caused to crops by plants and insects. This general phytopathological service is at the disposition of public administrations and private persons. By Royal Decrees of the 9th of September 1909 and the 8th of November 1912, this was completed by a special service, entrusted with the supervision of the measures taken both in the interior and on the frontiers, to prevent the spread of plants and insects injurious to crops, especially with regard to the horticultural trade relations with other countries.

Horse Breeding in Japan

by

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The number of horses in Japan in 1910 was as follows:

Original	Cross	Foreign	Total
1 209 334	341 462	13 847	1 564 643

For every hundred inhabitants there are 3.15 horses, which number is very low, when compared with other countries. The foaling number for 1910 is as follows:

Original	Cross	Foreign	Total
47 095	68 976	1 879	117 950

To improve the breed of Japanese horses the Horse Breeding Administration has been established under the control of the Army Minister to which belong three studs for horse breeding, one rearing farm for foals and 15 stallion depots; 6 Inspectors belonging to the Administration are inspecting the horse breeding of the country. The stallions and mares belonging to the Administration numbered 1 372 in 1910, among which there were 565 foreign (Anglo-Norman, Thorough-bred, etc.), 25 cross stallions, and 551 brood mares. The stallions are distributed among 262 covering stations, and they are placed for the public service between April and July. The fee of 5 to 10 Yen (1) must be paid for the service of superior stallions. The percentage of foaling is 50.

To encourage the improvements of horse breeding the Administration gives premiums and prizes at local shows, races, etc., which expenditures amounted in 1908 to about 630 000 Yen. The castration of foals is also encouraged by giving a premium of 4 Yen for one gelding.

(1) The Yen is equal to about 2 shillings.

For providing the remounts to the Army there are 10 Remount depots, and about 3 500 yearlings are annually purchased; these are kept there three years, and then distributed among the regiments.

There are also 11 breeding studs belonging to the local governments and about 250 000 Yen are expended for these establishments.

I. CHARACTERISTICS OF NATIVE HORSES.

The breeds of horses native to Japan have but few distinguishing characteristics. Prof. Imoi, however, groups them into four breeds according to form and character; the differences are due to diversity of land-features, climate, food, management, etc. because horses are bred throughout Japan proper, from Kyūshū in the South to Hokkaido in the extreme north. The breeds are as follows:

- 1) The Hokkaido, found throughout Hokkaido.
- 2) The Nambu, found in the extreme northern part of the Main land in the Aomori, Iwate and Akita Prefectures.
- 3) The Miharu, found mostly in Miyagi, Fukushima and Yamagata prefectures, south of the above-mentioned region.
- 4) The Satsuma Breed, found principally in Kagoshima and Fukuoka Prefectures.

1. *The Hokkaido Breed.*—The horses of the Hokkaido breed are small size. The island is believed to have originally possessed no horse, and it is surmised that the introduction of the horse from the mainland begins the history of the production of this useful animal. Ancient annals, however, tell us that certain Ainu, or aborigines of Hokkaido, made presents of horses as tribute to the authorities of the Main Island as early as 718 B.C., and we may take this as evidence of the existence of the horse at such a remote age. Real progress in horse breeding in Hokkaido begins, however, with the introduction of the Nambu breed into the island towards the end of the 18th Century. Although the Hokkaido breed is the outcome of this introduction, it yet has many peculiarities of its own. The horses of this breed range in height from only 3 ft. 8 in. up to 4 ft. 3 in., and they are more appropriately termed ponies. The small Hokkaido horses are decreasing gradually, being substituted by horses with a considerable admixture of foreign blood.

To describe the native Hokkaido breed in detail, we may say that the typical northern horse has a large heavy head and a long body; the legs are short and clean with well articulated joints and the hoofs are good; the rump is not so narrow and weak as is the case with horses of other breeds found in Japan, which is one of their greatest defects. The horse has likewise well-developed muscles capable of producing quick and easy motion. The horse can easily travel about 25 miles a day carrying a rider weighing about 125 pounds.

The principal horse-producing district in Hokkaido is Hidaka, which is followed by Iburi and Toshima in order of importance. The excellence

of the Hokkaido horses as good pacers is due to the vast extent of the land, which renders the use of the animal indispensable for intercourse among the country people.

In recent times, Thoroughbred horses have been introduced to produce valuable race horses; fine specimens of these often attain the height of 5ft. and more.

2. *The Nambu Breed.* — This breed is found typically in Aomori, Iwate and Akita; it is the heaviest as well as the strongest horse of the country. This region has long been famous as a horse-producing district, the Persian horse having been introduced some 400 years ago, and other foreign stallions have been brought in more than once. As in other countries, these fine imported breeds have never been admired by the people and they were hardly used for breeding purposes. The total lack of foreign blood in the Nambu horses observable in our days may be ascribed to this fact. At present, however, the introduction of Thoroughbred, Hackney and Anglo-Norman horses is encouraged for the improvement of the native stock.

The Nambu breed is easily distinguished by a large heavy head, thick low neck and a long slender body. The croup is narrow, short sloping and not well developed; the legs are short and rather heavy while the articulation is somewhat weak, the hoofs being large and flat. Owing to the poorly developed muscles, the gait is not very quick and light. The height is from 4ft. 7in. up to 5ft., but fine halfbred horses often measure more than 5ft. 2in. Most of the horses used in the army are of this breed.

3. *The Miharū Breed.* — To this breed belong the horses produced in the greater part of Northern Japan, especially in Miyagi, Fukushima and Yamagata and throughout the country as far as Gifu and Ishikawa in the West. This extensively diffused breed seems to have received Nambu blood in the proximity of Iwate and Akita, as in Miyagi, Yamagata and Fukushima, but the pure Miharū horse has its own clearly defined characteristics.

The head and neck in the Miharū horse are lighter than in the Nambu breed; the body is somewhat long and small, while the croup is narrow, short and sloping. The legs are not so short as those of the Nambu horse, and rather clean, but the hind legs are always forestanding with consequent poorer articulation of the hock-joint. The hoofs are rather hard and well formed. The horses have good action, since horsemanship has been greatly encouraged from ancient times. The height of the animal is 4ft. 6in. to 4ft. 9in. Horses of this breed are little used in the army compared with the Nambus. In Nagano we find a smaller form of the breed called the Kiso mountain horse, which may be grouped with the Miharū breed.

4. *The Satsuma Breed.* — Satsuma horses are found in the southern provinces of Kyūshū, viz. Satsuma, Hyūga and Osumi, where they have been reared from early times. It is stated that under the reign of the Emperor Nara, some five hundred years ago, Arabs were introduced,

to this fact the superiority of the Satsuma horses may be due. Horsemanship was common in ancient times, and this resulted in the breeding of excellent saddle-horses. In our days, horse racing is in great vogue in this region.

The characteristics of the breed are that both head and neck are well formed; the body and croup is regular, compact and short, while the defect of narrow chest is present. Both fore and hind legs are slender and perfectly clean, while the hoofs leave nothing to be desired. Although the animal has not strongly articulated joints, it has good proportions for a saddle horse. The Satsumas are the best race horses at present, and the average height is 4ft. 8in. Unfortunately the horse is not yet very much used in the army. The breed is widely diffused in Kyūshū, Shikoku, and, in general, in the western part of the Main Island.

II. THE REARING OF HORSES.

Feeding. — In Japan, horses are fed principally on the wild grasses of the locality, although this practice is somewhat modified in several provinces. In Hokkaido, which is rich in pasture, the animal is set free to graze; in Nambu, Akita, Miyagi and Fukushima, where the land is still comparatively unoccupied, the animal is fed partly in pastures and partly in stables. In the months between November and the May following, the animals are kept in stables, since the ground is covered with snow and no pasture is available. On the contrary, down in Satsuma, where the country is too densely inhabited to leave any ground for pastures, horses are mostly fed under cover by giving them green fodder freshly cut from the neighbouring fields and the ridges between the rice-fields. This is the case also in many other localities.

Hitherto, it has been customary among the farmers who rear horses to let them graze in the pasture in spring and summer and to feed them under cover on coarse hay, beans, millet and sorghum stalks during the winter. Some careful feeders mix a small quantity of bran with the regular diet as a sort of relish. Nowadays, however, most of the horses above medium grade are fed with a small quantity of beans, barley and oats, in addition to hay which was the exclusive diet of former times. Beans are added to the rations of the Nambu horses, as to that of the Hokkaido ones, while the Kyushu horses get some bran with their other food.

Exercise. — There is no established form of exercise. In Hokkaido, as well as in other districts where there is plenty of land, foals follow their dams when the latter go to neighbouring places with riders and packs on their backs, and this helps greatly to strengthen the young animals. Particularly in Hidaka exercise in the open is possible all the year round, as the snow-fall is little. In Akita and Nambu, where snow lies so many months and there is no place available for exercise in the winter, the poor animals are kept in stables, to the great detriment of

their health and strength. Of late, in many provinces valuable horses are exercised in the winter months, though only sparingly. Ordinary mares loaded with fire-wood and charcoal are taken to neighbouring towns and are followed by their foals; but such occasional trips should not be regarded as equivalent to that regular exercise so desirable for the young animals. It may be said that the foals are never sufficiently exercised by the farmers in the north who are engaged in horse raising. Even in districts where there is little or no snowfall, as in Kyūshū, the foals are seldom exercised during the winter months. It is only the valuable animals that are driven or ridden when young in order to give exercise suited to their development.

Breeding. — Covering is generally carried on from April to June, the dams being generally covered by stallions belonging to the State or to private individuals. Now-a-days good stallions are imported from France, England and Hungary, and these foreign races, as well as fine half-bred stallions produced in this country, are placed at the disposal of rears.

The birth rate comes up to 50 per cent. Mares in foal are generally used for some light sort of field labour; but in the north dams are often fed for the exclusive purpose of breeding, being never worked at all.

III. DIFFERENT USES OF HORSES IN JAPAN.

Hitherto horses have been reared principally for agricultural ends, to do occasional field work and to produce stable manure. In country districts, pack-horses were formerly used for transport. After the Restoration, the demand for army horses on the one hand, and for cart horses on the other, due to the increase of the army and the development of roads, has steadily increased. Since the importance of, and interest in, horse racing are not at all what they are in European countries, the breeding of race-horses has been but little cared for. Only the Koikawa farm, belonging to Baron Iwasaki, is maintained exclusively for the breeding of Thoroughbreds. Excepting horses bred for army use, it may safely be said that the aim is to produce either animals suited for agricultural purposes or pack-horses.

IV. THE IMPORTATION OF FOREIGN STALLIONS AND MARES FOR BREEDING PURPOSES.

Up to 40 years ago, the only imported stallions were American Trotters; but Arabs, Thoroughbreds and Anglo-Arabs were imported in later years. Quite recently, Hungarians, Anglo-Normans, Hackneys and Thoroughbreds have been imported. The business is conducted by purchasing committees chosen from among Inspectors of the Horse Breeding Administration, who are sent abroad every year; importations of between 80 and 90 stallions and mares at a time have been made during the last seven years.

V. THE SALE OF HORSES.

Before the Restoration, only foals one or two years old were sold at once, the control being in the hands of the then existing Feudal Government.

Since the establishment of Horse Breeders' Guilds in late years in recent localities, sales have come to be managed by these guilds. Recently, after the promulgation of a law with regard to holding fairs for Domestic Animals in 1910, various fairs have come into existence to undertake the sale of horses, such fairs being classified as Permanent, Periodical and Special, and the number is 1,044, inclusive of those held for the sale of cattle. According to a Government report of December, 1912, fairs exclusively for horses number 372. Some of these are considered too insignificant to be designated as fairs, but others are of considerable size and importance, these latter being mostly held by the Horse Breeding Guilds.

In northern Japan two-year-olds are, in general, offered for sale at fairs. We should add, however, that in Hokkaido it is customary to keep until the age of three is attained, and in Kyushu foals of the first year are put on sale, mostly at the so-called Periodical Autumn Fairs. Owners or breeders of young animals take them to the fair, where they are mostly purchased by horse dealers. Horses for army use are also purchased by Government Remount Purchasing Committees on these occasions, the remounts so purchased being taken to the remount depot, where they are properly reared for the service.

For the Government Stud, too, purchase is made of young animals whose fairs fit to be used as State stallions and brood mares; these are kept at the State Foal Yard for two years and then delivered to the stallion depots for the improvement of farm horses.

VI. HORSE SHOWS AND EXHIBITIONS.

In many horse-breeding districts, shows are held in each prefecture, and on some occasions combined shows are held for more than one prefecture. In the smallest show in one prefecture the number of exhibits is small. The Prefectural Show is held every year or each alternate year in each prefecture; the so-called "Interprefectural Show" is held only once in two years. In general, 3 to 6 year old animals are brought on the occasion; but in some cases two-year-olds are shown also, as well as colts. The horse shows held during the year 1911 throughout the country numbered twenty-two.

No large exhibition of horses alone is as yet held, but a considerable number of animals are always exhibited at the Industrial Exhibition, which is generally held once every ten years, for the whole country, and which selected exhibits are sent from the provinces, great interest being taken therein.

The awards bestowed both at horse shows and exhibitions consist of medals, prizes, and diplomas. In the case of a Prefectural Show prizes range from 200 to 300 Yen, 100 to 150 Yen, and 50 to 100 Yen for 1st, 2nd and 3rd class prizes respectively, and in addition a Medal of Honour is given. At an Interprefectural Show, the first prize is 500 Yen, but at exhibitions only medals of honour or diplomas have been awarded. Judges are always appointed from among Inspectors of the Horse Breeding Administration or Directors of State Studs, and they generally number three for an Interprefectural Show. At an exhibition, experts, distinguished men and others are appointed as judges. The distribution of awards is mostly made by the President of the Horse Breeding Administration in the presence of the Prefect, local officials and the prominent men of the locality.

Points. — The judges give their decision by taking into consideration the points of the animal, little attention being paid to its fitness for certain uses, etc. Trials are made only by riding; hitherto no trial has been made of capacity to jump, or to draw loads.

For the judgment of horses according to the use, or according to the races, no standard has yet been established.

The judges generally first examine the animals separately, after which a comparison of the exhibits is made, and then the final awards are given.

Carp-Breeding in Rice Fields in Italy

by

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Breeding carp in rice fields is no novelty, as the Japanese have carried it on for a century and a half with excellent results. But it should be remarked that the conditions of the rice fields in Japan are very different from those prevailing in this country, in that they are mostly permanent and under water the whole year, and may thus be considered as practically ponds. But even in Italy carp-breeding in rice fields has been practised: thus, Sig. Gasch carried it on on the property of Mezzolana, Bologna, and got very good results; but the breeding was eventually stopped for special reasons. It should be noted that the Bolognese rice fields are specially suitable for fish-breeding in being on warp land. It was therefore desirable to make trials in rice fields under the more general conditions of most of the Italian ones, and to arrange that the breeder should not be obliged to undertake any special work and in particular that no changes in the method of growing rice should be required. It was further desirable to

the relations between breeding the carp and growing the rice, and whether the latter was in any way damaged. The experiments begun in 1911 immediately gave very promising results; they were continued in the following years on a constantly larger scale, and it may now be said that breeding in rice fields has reached the stage of application in practice. The merit for this should be given to the Lombardy Agricultural Society; when the experiments had given good results, this body took up the question in an active manner, facilitating the purchase of fry by the growers, undertaking supervision, and carrying out a general propaganda. The breed of carp adopted for this work is the Galician mirror-carp, characterized by its deep and short body, which gives it a thick-set appearance, a selected race which grows rapidly and has a larger proportion of bone than the ordinary carp. The mirror-carp does well in our fields, even if kept for three years; but in rice fields in which for any reason the water is low (much below 8 in.), or may be so under certain circumstances, it would be better either not to grow the fish beyond two years or to use a flatter and longer type, such as the Bohemian carp.

The process of spawning to obtain fry to turn out in the rice fields is simple. The spawning pond should not be too big; an area of about 1/2 ays. and a depth of 20 in. is sufficient; the sides should be sloping. The pond is first sown down to grass and then filled with water; bundles of reed or pine branches are put in for the fish to lay on. When the depth of the water reaches 8 inches the carp may be turned in; there should be at least two males to each female, and they must have been kept previously in clean water and the sexes separated. Spawning takes place usually between May and July. If the conditions of the pond are favourable, the fish spawn within three or four days, laying numerous eggs which are fixed to aquatic plants or to the bundles of branches.

It may be reckoned that a female weighing 2 1/4 lbs gives an average of 100 000 eggs, but a heavier carp may give 250 000 or even more. The fry develop more or less rapidly according to the temperature, but 10 to 12 days may be taken as the usual time for hatching. In this way the fry can be had for the rice fields; the number turned in should be from 800 to 1600 per acre, according to conditions. Anyone not wishing to undertake the breeding of fry can easily purchase them; the present price is about 6 lire (4s 6d) per thousand.

The only special provision required is to fit the inlets and outlets of the field with wire netting, to prevent fish getting in from outside and the fry getting out. This, of course, should be done before the water is let in.

When turned into the rice field the fry weigh about 30 mgm. each (about 1000 to the ounce); as the conditions are excellent, as regards food and temperature, they very soon reach a moderate size; observations so far show that at the rice-harvest, three months after the fry have been turned in, fish weighing 100 to 200 gms. (3 1/2 to 7 oz.) can be found. The presence of the carp in the field in no way hinders the usual cultivation operations of the rice, such as weeding and drying-off. The first year is done without any attention being paid to the fish; for the second, the

fish must be taken out when the water is drawn off, and put into some ditto or temporary basin; afterwards they go back to the field again. When they are taken out again at the harvest they can be put into a pond or tank for winter. As they are more or less torpid in winter, and require hardly a food, they may be kept in a fairly limited space, and even not fed. A tank of 3 ft. cube will hold about 85 lbs. of fish. The following summer the carp can be turned into the rice field again when the young plants are firmly rooted; about 80 should go to the acre. At harvest-time each fish may weigh 2 lbs. or more. Of course the number will depend on how many are turned in, but the individual weight will be greater if they are fewer. The carp may be put into the rice fields for a third summer, in which case they reach nearly 5 lbs. in weight; but it is generally not advisable to keep them beyond the third year, as firstly they are too big for the comparatively shallow water, and secondly the increase in weight is small compared to the amount of food they take.

It is thus seen that after the second summer fair-sized carp, almost marketable, can be obtained, so that anyone wishing to reduce the trouble can purchase young carp in the spring; these weigh 15 to 20 gms. ($\frac{3}{4}$ oz.), and at harvest-time run to 600 or 700 gms. ($1\frac{1}{4}$ to $1\frac{1}{2}$ lbs.). Thus a fair yield could be got in three months. The experiments so far made indicate that an acre of rice field may yield 90 lbs. of carp.

The presence of the carp is not only not harmful, but actually beneficial to the rice crop. In many cases it has been found that the crop in fields containing fish is cleaner, so that the second weeding is not required; in a few cases, also, the fields with fish in them have given a heavier crop of rice than those without. This is not to be wondered at, when it is remembered that carp eat many insects, molluscs and other animals which damage the rice.

The experiments are not yet sufficiently numerous to make this point certain, but there is no doubt that the crop is in no way harmed by the fish.

The flavour of the carp is generally very good, even when they are freshly taken from the rice field; but if they have a muddy taste, this can be readily got rid of by keeping them a few days in perforated barrels in running water. Carp are so unexact that they can easily be kept till a convenient time for selling them; the demand for them is generally very good.

During the earlier years of the experiments the requests for fish from rice-growers were very few; but now they are comparatively numerous, and come from various parts of Italy besides Lombardy. The growers have seen the good results, and are taking up carp-breeding widely; they are trying hatching for themselves and endeavouring in every way to make this industry practicable and profitable. All that remains to be done.

There are in Italy 367 040 acres of rice fields, of which nearly one-third could be used for carp breeding; this means that the value of such fish might be hundreds of thousands of pounds; and this could be obtained without in any way interfering with the rice crop, which indeed would be rather benefited. Carp is thus an extra product which can be obtained

very limited expense and trouble on the part of the rice-grower; the crop could be used for home consumption or as material for a small fry. Now that the difficulty of getting cheap food is becoming daily greater in both town and country, it would be very useful to have a supply of good, wholesome fish at a low price. The small renter might have a tank from which he could get fish whenever he needed it; this would at any rate serve to improve and vary his generally poor fare; the city markets could have good fish at low prices, to be sold alive so that it would be guaranteed fresh to the purchaser; thus the poorer classes could easily obtain a wholesome and nutritious food.

Besides this, carp could be used, at any rate as a subsidiary means, for the control of malaria; since they feed on the eggs and larvae of mosquitoes, spreading them in the rice fields in malarial zones ought to facilitate the task of combating this pest, which is not yet dealt with. Last year another fish, the trout-perch, was tried in rice fields; it does not reach the same size as the carp, but its flesh is of much better quality, and it shows that various fish may be grown in rice fields, but there is no doubt that carp are the most suitable for this purpose and give the best results (1).

A Study on Milk and Cheeses in Greece, with regard to their Chemical Composition

by

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In the laboratories of agricultural chemistry at the Ministry of National Economy, investigations are being made into the products of animal breeding and agriculture of the country, especially as to their chemical composition, which is of great importance for the improvement of these products, as well as from the economic and administrative point of view (discovery of and prosecution for frauds). The principal task of these laboratories is the determination of the chemical composition of milk and cheeses.

For further particulars on the methods of breeding carp, see: SUPINO, *La carpi-
nelle risaia, cenni biologici e pratici*. Milan, Società Agraria di Lombardia, 1913.

The figures given in this article are taken from observations extended over two years; during this period it has been possible to consider the different cases and conditions of sale of these products, and all samples have been taken under our own direct control, or under the control of an experienced and trustworthy person.

I. MILK.

Milk stock and conditions of milk production.

A. Cows. — The number of cows kept specially to produce milk in the towns is relatively very small; it amounts to about 3500, of which about 2500 are in the sheds of Athens and its neighbourhood, the remainder being in a few other large centres.

Almost all these cows come from abroad, especially from Switzerland and Russia, a very few come from Holland, and a very few are bred in the country, but always out of cows obtained from abroad. They are kept always in the sheds and fed intensively, and give 450-650 gallons of milk a year.

There are also indigenous cows, but these are never milked; they are small and live almost entirely on the pastures, very rarely getting any additional food. They do some light work, but they are kept almost entirely to breed working oxen for the peasants.

Here and there in the islands of the Archipelago (Naxos, Thos, Andros) some rather larger cows are found; these are milked, and the milk is used for making butter and cheese. They yield up to 130 gallons a year. These animals, though generally kept at pasture, get some extra food, and are better looked after than the majority of the cattle in other parts of Greece.

B. Sheep. — In Greece the only widespread breed of sheep is the "Vlachica", which numbers about four million head. They are small and very hardy animals, living as migratory flocks, in summer on the mountains and in winter on the plains; they never get any extra food and receive practically no shelter against the weather. The ewes rarely give twins; they milk for five or six months, giving 300 or 400 grams (1 to 14 oz.) a day.

In the islands of Crete, Scopellos, Zante and Chios there are rather larger sheep of a better breed than those living in the rest of Greece; they are known by the names of the islands from which they come: Cretica, Scopellitica, Zakintina, Chiotica. They are generally kept tethered and get extra food in the shed. Most of the ewes drop two lambs, and in the Scopellitica race four is not rare. The milk yield varies according to the treatment; it often reaches 2 to 5 pints, especially in the first three months after lambing.

Goats. — There are about three million goats in Greece; the mountain breed, known as the mountain breed from the regions where they are found, gives little milk; these goats live always in the open and get any extra food. They drop one or two kids, and yield 400 to 500 grams (14 to 18 oz.) of milk a day for five or six months. Besides this mountain breed, there are a large number of Maltese goats, which are kept tethered. There are one or two at each house, and with proper food and proper attention they give 3 to 5 pints a day. They are usually kept as herds, and in this case the owners are graziers, who produce fresh milk; the sheds and pastures are generally round the large towns, and each day the goats are taken into the town and milked in front of the customers. In Greece, in fact, the fresh ewes' and goats' milk sold in the towns comes from the animals kept near by, while the milk of the large flocks and herds on the mountains is only used for making cheese and butter.

TABLE I.

*Fat content of the milk of 285 cows sampled
in the various stables in Athens.*

Percentage of fat	No. of cows
3.1-3.5	4
3.6-4.0	47
4.1-4.5	113
4.6-5.0	70
5.1-5.5	29
5.6-6.0	15
6.1-6.5	5
6.6-7.0	2

The samples were taken from cows in full milk, without any account being taken of the breed or of the date of calving; all had, however, calved at least a fortnight before. It should be remarked that in the least fat groups, with fat over 6 per cent., the cows, though second-calvers, were only giving $4\frac{1}{2}$ to 5 quarts a day.

TABLE II.

Chemical composition of mixtures of cows' milk.

Breed		Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
12 Swiss	Maximum	1.0320	14.08	5.30	3.63	4.95	0.78	86.4
	Average	1.0309	12.72	4.14	3.33	4.48	0.76	87
	Minimum	1.0285	11.96	3.55	2.94	4.21	0.73	88
15 Swiss	Maximum	1.0320	13.53	5.05	3.63	4.68	0.79	86
	Average	1.0305	12.59	4.15	3.21	4.47	0.76	87
	Minimum	1.0285	11.95	3.45	2.79	4.14	0.74	88
16 Swiss	Maximum	1.0325	14.17	5.15	3.98	4.62	0.81	87
	Average	1.0312	12.92	4.32	3.41	4.41	0.78	87
	Minimum	1.0295	12.22	3.95	2.67	4.14	0.75	88
8 Russian	Maximum	1.0320	13.67	5.18	3.45	4.81	0.79	87
	Average	1.0310	12.96	4.41	3.26	4.54	0.76	87
	Minimum	1.0290	12.45	4.00	2.83	4.21	0.73	88
7 Russian	Maximum	1.0310	13.76	5.35	3.66	4.68	0.81	87
	Average	1.0299	13.06	4.70	3.21	4.38	0.76	86
	Minimum	1.0270	12.41	3.90	2.85	3.87	0.74	86

N. B. — In these different cases analyses were made each week for a year; in some of the cows were removed and replaced by others during this time, but the total number remained the same.

TABLE III.

Fat content of cow's milk at different times during milking.

First half litre	1.4 per cent
After the fifth litre	3.1 " "
Last half litre	7.6 " "
Average of the ten litres	4.7 " "
[One litre = 1 $\frac{1}{8}$ pint; 10 litres = 2 $\frac{1}{8}$ gallons.]	

The milk of a cow which had just calved contained 1.8 per cent. of fat; a fortnight later it was up to 4 per cent., and then remained constant except for slight variations due to the lactation period or the season.

TABLE IV.

Chemical composition of milk from a flock of 400 Vlachica ewes.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0370	19.32	8.08	6.59	4.56	0.94	82.10
Average	1.0358	18.45	7.11	6.24	4.19	0.92	81.55
Minimum	1.0332	17.90	6.05	5.82	3.98	0.90	80.68

TABLE V.

Chemical composition of milk from a herd of 300 mountain goats.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0320	16.67	7.12	4.49	4.24	0.82	85.97
Average	1.0305	15.22	6.11	4.20	4.12	0.80	83.77
Minimum	1.0300	14.03	5.22	3.95	3.95	0.79	83.33

The analyses given in Tables IV and V were made weekly for six months.

TABLE VI.

Chemical composition of the milk of Maltese goats.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0326	16.59	6.80	4.81	4.54	0.88	88.34
Average	1.0303	13.79	4.91	3.80	4.27	0.81	86.21
Minimum	1.0270	11.66	3.68	2.05	3.83	0.74	83.41

The samples for the analyses shown in Table VI were taken at random from goats brought round the streets for the sale of milk. This explains the great range in the figures, which represent 125 analyses made over a period of two years.

II. MILK FRAUDS.

The chief frauds practised are watering and skimming; the use of various substances to improve the keeping qualities of the milk is little known in Greece.

III. CHEESES.

The cheeses of Greece may be ranged in two great classes: soft and hard. They are made only from ewes' and goats' milk, and are almost entirely consumed in the country. In 1910 the Royal Agricultural Society of Greece organized a cheese show in Athens; most of the provinces took part in this by sending the different types of cheeses made in their districts. We took advantage of the occasion to obtain samples for analysis of nearly all the cheeses.

The results of these analyses, with some others made later, are shown in Table VII.

TABLE VII.

Chemical composition of the principal Greek cheeses.

Type	Name	Water %	Ash %	Fat %	Nitrogenous matter %	Salt %
Soft	Teta	46.206	6.736	26.464	20.594	4.490
"	"	45.475	6.476	27.280	20.769	4.386
"	"	45.280	5.279	30.048	19.384	3.012
"	"	44.180	5.035	32.679	18.106	2.715
"	"	48.121	5.822	27.399	18.658	3.737
"	"	51.751	5.702	24.567	17.980	3.796
"	Touloumotyri	45.835	5.148	29.173	19.844	2.795
"	"	37.107	5.469	31.694	25.730	3.254
Hard	Kephalotyri	26.104	6.223	29.556	38.117	2.776
"	"	26.318	9.869	28.964	34.849	6.913
"	"	32.193	10.185	28.567	29.055	5.963
"	"	30.024	8.327	27.419	34.230	5.035
"	"	25.588	8.018	36.288	30.106	5.393
"	"	25.835	9.308	28.527	36.330	6.709
"	"	27.641	7.154	25.316	39.889	3.888
"	"	20.066	6.085	39.618	34.231	3.407
"	"	38.427	7.601	25.158	28.814	3.959
"	De Kritis	38.745	7.600	20.313	33.342	4.430
"	"	33.341	7.555	28.295	31.809	4.271
"	"	37.517	6.980	23.618	31.885	3.939
"	Agraphon	34.124	6.582	30.992	28.302	3.894
"	"	28.398	6.165	36.561	28.881	3.317
"	"	30.329	6.520	33.403	29.748	3.522
"	"	29.934	9.314	30.202	30.550	6.005
"	Dutch	33.648	7.395	32.193	26.764	4.246
"	Kasseri	34.518	5.527	20.936	39.019	2.462
"	"	35.216	5.776	24.934	34.074	3.043
"	"	34.540	5.605	20.074	39.781	2.701
"	"	28.978	7.799	33.590	29.633	5.202
"	St. George	28.527	4.325	36.509	36.639	0.888
"	Skyros	22.139	6.031	38.161	33.669	3.172
"	Kassavetie	22.428	5.352	37.555	34.665	2.236

The Present State of the Potato-Drying Industry in Germany

by

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The most important of all the hoed crops is the potato. As a human food, a feeding-stuff and a raw material for technical operations (starch manufacture and distilling) it is of the greatest consequence. Germany's potato crop occupies 8.1 million acres, that is over 12 per cent. of the total cultivated area. All the other hoed crops together only amount to 4 per cent. The yearly production of potatoes in Germany has reached 44 $\frac{1}{2}$ million tons. The consumption is about 40 million tons; of this about 13 million goes for human consumption, 16 million for cattle food, 4 $\frac{1}{2}$ million for industrial purposes and 6 $\frac{1}{2}$ million for seed. The difference between production and consumption is 4 $\frac{1}{2}$ million tons; this forms the loss, which is due partly to natural respiration during storage and partly to rotting. The 4 $\frac{1}{2}$ million tons of potatoes used in industry are distributed as follows: 2 $\frac{1}{2}$ million for distillation, 1 $\frac{1}{2}$ million for starch production, and half a million for drying. The annual loss of potatoes at present equal to the amount used in industry.

With but few exceptions the potato crop has steadily increased, rising from 25 million tons in 1887 to nearly 50 million in 1912. The yield per acre has in the same period risen from 3 tons 6 cwt. to 5 tons 9 cwt. while the yield per head of population has increased from about 10 lb. to about 14 cwt. A still further increase of the potato yield is to be anticipated for certain from further improvements in cultivation. The consumption of potatoes has not kept pace with the production.

Potato-drying should therefore establish an equilibrium between the two and at the same time reduce the yearly loss. The following statistics show how well suited potato-drying is for these purposes. In 1907, 111 factories dealt with 125 000 tons of potatoes and produced 30 000 tons of the dried material. In 1912 there were 426 factories, which used 550 000 tons and turned out 120 000 tons of dried potatoes. Thus in five years the number of potato-drying factories has increased three and a half times while the material dealt with has increased four and a half times. The potentiality of the existing factories is, however, much greater; with complete utilization of their apparatus, they could take 1 $\frac{1}{2}$ million tons of potatoes, making 400 000 tons of dried potatoes. So far the disposal of the produce has presented no difficulty. With a view to maintaining favourable conditions of the market, keeping prices steady and increasing the area of disposal, the Society of German Potato-driers has arranged an economic understanding; this result has been reached by the formation

the Sales-Union of German Potato-driers, to which most of the factories belong.

The technical development of potato-drying has in a short time reached a high degree of perfection. The German machine-industry has worked so persistently at the construction of the driers, that the dried potatoes now turned out by them are of unsurpassable quality. The ones which have done most in this direction are: J. Aders, of Magdeburg; Frittner, of Uerdingen; Förster and Co., of Magdeburg; Imperial, at Meissen (Germany); Kletsch, of Coswig near Dresden; H. Paucksch A. G., at Landsberg a. W.; the "Tätosin" Drying-machine Company, of Berlin; Venuleth and Ellenberger, of Darmstadt; and Wagner, of Cistrin.

The drying machines used at present are on two different principles: drums and rollers. Both are widespread, but the roller-system tends to preponderate. The two systems differ in the source of the heat and in the form of the product. In the drums, the drying is carried out by gas from coke, lignite or coal, mixed with air, while the roller-apparatus uses steam or superheated oil. The drum-apparatus turns out potato slices, the roller-apparatus flakes. The drum-system is represented among others by the firms Büttner, Imperial and Wagner.

Büttner's apparatus consists of a fluted drum, in which the potatoes, prepared from washed potatoes by a special machine by the same maker, are slowly turned over. The hot gases from the furnace are drawn into the drum by an aspirator, and come into contact with the slices, from which they draw off the moisture; this escapes from the drum through a "Cyklon", while the dried potato slices pass out at the far end of the cylinder; after passing through a refrigerator they are ready for packing.

The Imperial drying-apparatus consists of a trough in which revolves a cylinder with perforated casing; the outer surface of this casing is provided with pins, which carry the slices from the trough over the drum where they come in contact with the hot gases streaming through it. The gases enter into the drum through a tube. The dried slices are carried to the outside by an air current.

Wagner's drum-apparatus (v. Schütz system) is composed of first and second driers. Each drier consists of four enclosed superimposed drums, in which cylindrical stirrers keep in motion the material to be dried. The oven in which the hot gas is prepared is situated between two driers and communicates with a chamber provided with valves, in which the gas is mixed with air before being led into the drum. Another of Wagner's machines is the simplex drier, which has five fixed superimposed drums. It is suited for small concerns (about 8 cwt. per hour). The turning of the dried product is performed by a special machine. The discharge of the material to both driers and to the cooler is done by aspirators.

Besides the machines mentioned, drum driers are built by the following firms: Bernburg Machine-Works, at Bernburg; Jalm, of Arnswalde; Petry Hecking, of Dortmund; Sauerbrey, of Stassfurt; and Soest and Co.,

of Düsseldorf. The improvements in construction refer chiefly to special methods of conducting the hot air to and from the apparatus; in this way the consumption of coke has been reduced from 16 or 18 lbs. to 10 lbs. per 100 lbs. of potatoes.

The roller machines have undergone an essential modification. The first of these consisted of two hollow revolving cylinders, placed close together, and heated by steam at a pressure of three or four atmospheres. The washed and steamed potatoes were brought into the rollers by a distributor; they were then crushed between the rollers, forming sheets of paste of the thickness of paper; these were then scraped off, after making three-quarters of a revolution, by knife-blades against the rollers. The steam was drawn off by aspirators close to the rollers.

Nowadays the rollers are no longer put close together, nor are the aspirators near the rollers; but the speed of the rollers and the steam pressure are increased. With appropriate arrangement of the carrying and crushing cylinders, and increase of the steam pressure from 3 or 4 to 5 or 6 atmospheres and of the number of revolutions from 3 or 4 to 6 per minute, a greater capacity of production has been obtained. At present every square foot of surface of the rollers allows of the drying of 14 to 16 lbs. of potatoes instead of 10 to 12 lbs. The roller-machines built by Paucksch are, in the modern construction, provided with crushing rollers, allowing the drying rollers to be further apart. In this way also the heavy pressure of the rollers against one another is avoided, so that the wear is reduced. By the use of the crushing rollers, the thickness of the layer of potato on the drying rollers can also be increased, so that the production is greater and there is no likelihood of getting an over-dried article. The use of powerful ventilators, rendering a chimney unnecessary, allows all the machines to work separately, as they are arranged so as to absorb the steam from above and below the rollers.

The apparatus built by Förster and Co. is noteworthy for having its two rollers very far apart (10 inches). By this arrangement damage to the rollers by stones or other hard substances is almost impossible, and the wear on the rollers and knives is very slight. The potato-mass is brought into the drying-rollers by guiding-rollers.

The roller-apparatus of J. Aders differs from most others in the arrangement for bringing the material into the rollers. Here the potato-mass is placed below the rollers, whereas in all the others (except Förster's machine) it is placed above; in consequence, the rollers of these two machines turn in the opposite direction from those of the others, namely outwards instead of inwards.

With the exception of Kletsch's apparatus, all the roller-driers use steam. Kletsch's rollers are heated by mineral oil at 230-240° C.; the oil is heated to about 240° in a special oven, and led through the cylinders and back to the oven by pumps; the loss of temperature of the oil during the whole circuit is only about 3° C. The same oil is used again and again, and the loss in a season's working is reckoned at only 10 per cent. The oil requirement of each machine is about 10 cwt. In spite of the

the temperature, no burning of the dried material takes place, as the rollers make 6 or 7 revolutions per minute. The use of hot oil for heating the rollers allows the apparatus to be run by electricity, thus avoiding all use of steam and boilers except just for steaming the potatoes. The oil is heated by hot gases from the combustion of coke, which pass round a cylinder containing the oil. To utilize the escaping hot gas, an Imperial machine is combined with the Kletsch roller-machine in such a way that the hot gases pass into the Imperial slicing machine, where they are used to dry off the moisture from the potato-slices.

The improvement of the roller-apparatus, the use of hot-water pumps to return the water condensing in the rollers to the boiler, the improved desorption of the steam from the potatoes, etc., have resulted in a diminution of the steam used taking place at the same time as the increase in the working-power of the machines. Whereas formerly 100 to 120 lbs. of steam were required per 100 lbs. of potatoes, the present requirement is only 60 to 80 lbs. The total costs of desiccation have therefore diminished, though they must still be considered high. The reasons for this are: higher wages of labour, higher prices of coal, and the cost of the now unavoidable storage of the dried potatoes. The total cost varies between $1\frac{1}{2}$ and $5\frac{1}{2}$ shillings per 100 lbs. of raw potatoes.

Hand in hand with the improvement of the apparatus has gone an improvement in the quality of the dried potatoes. While formerly the dried ware was turned out not always free from objection (too damp, gritty, etc.), the present products are of remarkably good character. These are therefore used not only as stock feed, but as human food and raw material for industries; their chief use is, however, for cattle, and in this way they are of great importance. Numerous feeding experiments have shown both slices and flakes to be sound concentrated foods, relished by all classes of stock. For fattening pigs flakes have been found better than slices.

In distilleries and yeast-factories good results have been obtained from the use of dried potatoes, which seem inclined to replace maize. Both slices and flakes can be used for preparing lactic acid, and their yield is at least equal to that of maize. For making gums, dried potatoes in the form of meal have also been found suitable.

Dried potatoes in the form of meal (called "Kartoffelwalzmehl" or "Flockenmehl") are now much used in the kitchen and by bakers and confectioners. For preparing soups and moulds "Kartoffelwalzmehl" is very valuable, making them tasty and readily digestible. In bake-houses and confectioneries the "Flockenmehl" can replace 10 or 20 per cent. of wheat flour; the produce tastes well and keeps longer than it otherwise would. The use of "Flockenmehl" facilitates the working without increasing the cost.

In the ten years of its existence potato-drying has made great technical and economic progress, and its importance to the nation is now generally recognized.

SECOND PART.
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1015 - An Act to Regulate the Size and Description of Cases used in the Sale and Export of Fruit and for purposes incidental thereto, Queensland.

This Act may be cited as "The Fruit Cases Act of 1912", and came into force on July 1st 1913. It prohibits the sale in Queensland, and the export thence to any place within the Commonwealth, of any fruit which is not packed in a case of the prescribed size, measurement and capacity. All cases used for fruit-packing must be new, or clean and free from any insect or fungus disease. All cases used for export must be new. No person shall sell fruit in a case in Queensland, or export fruit in a case until such a case has been visibly and durably impressed, printed, or marked at one end on the outside within a space measuring not more than five inches long and two inches wide:

- a) with the name and address of the packer of the case; and
- b) with the words "Guaranteed by the packer to contain two imperial bushels", or "Guaranteed by packer to contain one imperial bushel" or one-half or one-quarter of a bushel as the size of such case may warrant.

Any person who does not comply with these regulations shall be liable to a penalty not exceeding five pounds for the first offence, and of not less than two pounds, or exceeding fifty pounds, for every subsequent offence.

Any person who:

- a) alters the size of, or tampers with, any case bearing the packer's name, address and guarantee; or
- b) wilfully defaces, or alters, or tampers with the packer's name, address, or guarantee on any case; or
- c) sells fruit in an unclean case, or in a case infected with either insect, or fungus disease;

shall be liable to a penalty not exceeding ten pounds, or to be imprisoned for any period not exceeding six months.

- Decree and Order relating to Agricultural Instruction under the Departments and Communes in France. — Décret et Arrêté portant Règlement d'administration publique pour l'exécution de la Loi du 21 août 1912 relative à l'Enseignement Départemental et Communal de l'Agriculture. — *Journal Officiel de la République Française*, Year XIV, No. 165, pp. 5279-5281, Paris, June 20, 1913.

The reorganization of the agricultural services and agricultural education, laid down in article 1 of the law of the 21st of August 1912 (1), been regulated by the Order of the 17th of June 1913 and the Decree of the 12th of June 1913.

The dissemination of the agricultural information possessed by the departmental (2) directing offices of the agricultural services is to be carried out by means of lectures and publications. The lectures are given by the directors of the agricultural service and by the professors of agriculture. A ministerial order, made on the proposition of the departmental director of the agricultural services, and after consultation with the agricultural inspection service, fixes each year for each department the conditions under which the dissemination of agricultural information is to be carried out. This order, in particular, fixes the number and programme of lectures to be given during the course of the year.

The publications may consist of bills containing instructions and orders for agricultural practice, to be signed by the prefect; also of leaflets, notices for distribution in the communes under the direction of the prefects and of the presidents of agricultural associations and syndicates, in receipt of grants from the State or the department.

The establishments for public instruction in which the agricultural instruction is part of the functions of the directing offices of the agricultural services are indicated for each department by ministerial order. In establishments for public instruction not under the Ministry of Agriculture, the agricultural instruction is given by the director of the agricultural services, the professor of agriculture assisting in the directing offices, and the other professors of agriculture, under conditions fixed by ministerial order made conjointly by the Minister of Agriculture and the Minister of Public Instruction for the establishment in which the agricultural instruction is given.

The director of the agricultural services assists, in the department, in the working of the service of economic and social interests of agriculture, of rural hygiene and rural hygiene. For this purpose, all demands for grants from the funds of the State or department coming from societies, mutual agricultural associations, breeding syndicates, cooperative credit banks and other agricultural bodies are submitted by the prefect to the director, who advises as to the suitability of the case. The programmes of all agricultural shows must also be approved by him. He must undertake enquiries for the creation of chairs of agriculture and the

(1) See No. 1594, B. Dec. 1912.

(2) In this article "departmental" and "department" refer to the administrative departments ("départements") of France.

(Ed.).

areas under their charge, and for starting practical schools, farm-schools, winter agricultural schools, house-keeping schools or other institutions for technical agricultural education. He also makes enquiries with regard to demands for advances of money made under the laws on agricultural mutuality, credit and cooperation. He is an *ex officio* member of departmental committees for awarding prizes for silkworm rearing, oil growing and industrial crops, as well as of the committees for agricultural and viticultural studies, and of the committees of herdbooks, studbooks and other genealogical books for breeds of live stock. He may undertake the functions of general commissioner of the shows organized by the State. He may be entrusted by the prefect with investigations on questions of rural hygiene, and may be called on to assist commissions concerning agriculture.

The director of the agricultural services takes part in agricultural investigations; he is also given the direction of the experimental and demonstration fields for agriculture and vine-growing.

Each year the director of the agricultural services presents to the prefect a report on all the agricultural services of the department.

The director, head of the agricultural services in his department, assisted by one or more professors of agriculture, who fill the chairs corresponding to the districts determined (by ministerial order), and by professors for special subjects (dairy industry, horticulture, bee-keeping, silkworm-rearing, etc.).

The holder of the chair of agriculture in the town in which the directing-office of the agricultural services is situated acts as and bears the title of assistant to the director of the agricultural services (1).

The professors of agriculture, under the control of the director of the agricultural services of their department, are entrusted with the spreading of agricultural information: 1) by lectures to farmers; 2) by regular courses in the establishments for public instruction designated by ministerial order.

The professors of agriculture are, in their respective districts, to assist in investigations, agricultural statistics and commissariat supply, organization and oversight of experimental fields and agricultural demonstrations, organization of shows, and the creation and control of various societies, and in general to carry out all missions and work entrusted to them by the director of the agricultural services. They are consulted on questions of agricultural education or the agricultural service concerning their districts.

Lecturers in the practical schools of agriculture may, at the same time, undertake the duties of professor of agriculture in the district in which the school is situated.

(1) "Adjoint à la direction des services agricoles".

The Most Important Products of the German Colonies. — *THULE* in *Archiv für Deutschen Landwirtschaftsrats*, Year 37 (Report of the Transactions of the 41st General Meeting of the German Council of Agriculture from the 11th to the 14th of February 1913), pp. 211-222. Berlin, 1913.

In the year 1911 the German Colonies produced 3 520 000 lbs. of cotton against 2 420 000 lbs. in the preceding year. The 1912 cotton crop valued at 6 050 000 lbs. Of this quantity by far the greatest portion supplied by German East Africa, while Togo contributes but little to exports.

The cultivation of sisal hemp has developed largely in German East Africa, so much so that in 1911 this colony was able to export 11035 tons sisal worth £220 500.

The breeding of sheep for their wool is constantly increasing in importance in German South-West Africa; the flocks aggregate about 10 head and the exports of wool amount to 187 000 lbs.

Kapok also is on the increase in the German colonies. The production of silk, especially in Kiautschau where close on 30 000 mulberry trees have been planted, is likewise increasing.

As for rubber, a number of planters in German East Africa have started for working up their crude rubber on cooperative lines. In 1911 German South Sea Islands became rubber producing countries: Samoa exported in that year £637 worth of rubber, and New Guinea exports of 4 400 lbs. of gutta-percha.

The value of the total exports from the German colonies of oils, fats and produce yielding them amounted to about £1 078 000.

The South Sea Islands are actively engaged in the production of copra, of which they exported in 1910 11 000 tons, worth £171 500. The year German East Africa exported about 5040 tons of copra, worth £100. In 1911 the total value of copra exports amounted to £450 800. German West Africa supplies chiefly the fruits of the oil palms and exported in 1911 nearly £400 000 worth of palm oil and kernels.

In 1911 German South-West Africa produced 1 194 000 lbs. of coffee, worth £12 250.

Tobacco is grown in large quantities in Kamerun and in South-West Africa. Maize is produced in all the colonies, but most of it is consumed on the spot. The cacao produced in the German colonies represents one of the total imports of cacao into Germany.

Among the fruits grown in the colonies, bananas and pineapples are to be mentioned.

Agricultural Education and Research in England and Wales (1) — *Board of Agriculture and Fisheries*, Leaflet No. 197, 16 pp. London June, 1913.

The Board have since 1888 made grants which now amount to £18 500 annually in aid of the higher agricultural education in England and Wales, the grants amounting to £7000 for agricultural education of a less advanced character in most of the counties. Besides the above, grants are also

¹ See No. 452, B. May 1913.

available from the Development Fund for the further extension of education of this type.

England and Wales possess 14 agricultural colleges and agricultural departments of Universities or University Colleges, which after a three or four years' course give the degree of *B. Sc.* in agriculture or the diploma of agriculture. These are the agricultural departments of the following: 1) University College of Wales, Aberystwith; 2) University College of Wales, Bangor; 3) Cambridge University; 4) University of Leeds; 5) Armstrong College, Newcastle-upon-Tyne; 6) University of Oxford; 7) University College, Reading; then the following Agricultural Colleges: 1) Royal Agricultural College, Cirencester; 2) College of Agriculture and Horticulture, Limes Chapel, Cheshire; 3) Midland Agricultural and Dairy College, Keston, Derby; 4) Harper-Adams Agricultural College, Newport, Sal; 5) Horticultural College, Swanley, Kent; 6) Agricultural and Horticultural College, Uckfield, Sussex; 7) South-Eastern Agricultural College, Wye, Kent.

All the above institutes have farms attached for practical and research work, and many of them besides the usual course of studies hold special courses of shorter duration.

There are also four special institutions: 1) The British Dairy Institute, Reading; 2) Harris Institute, Preston; 3) National Fruit and Cider Institute, Long Ashton near Bristol; 4) Royal Horticultural Society's School, Wisley, Surrey.

There are further twelve farm and dairy schools and similar institutes founded and provided for by the county councils.

As regards agricultural research a sum of £31 000 per annum is allowed from the Development Fund for the purpose of aiding research into certain definite groups of subjects.

The institutions and the subjects selected are as follows:

<i>Subject</i>	<i>Name of Institution</i>
Plant Physiology	- Imperial College of Science.
» Breeding	{ Cambridge University.
» Pathology	{ John Innes Institution.
» Pathology	- Royal Botanic Gardens, Kew.
Fruit Growing, including the practical treatment of plant diseases	- Bristol University, in conjunction with National Fruit and Cider Institute.
Plant Nutrition and Soil Problems	- Rothamsted Experimental Station.
Animal Nutrition	{ Cambridge University.
Animal Nutrition	{ Leeds University.
Animal Pathology	{ Royal Veterinary College.
Animal Pathology	{ Board's Veterinary Laboratory, Alford, Middlesex.
Dairying	- University College, Reading.
Agricultural Zoology, with special reference to Economic Entomology	- Manchester University.
Agricultural Zoology, with special reference to Helminthology	- Birmingham University.
Economics of Agriculture	- Oxford University.

A sum of £3000 per annum has also been allotted to provide assistance in respect of special investigations for which provision is not otherwise made.

Another direction in which agricultural education and research is being developed is in the supply of technical advice to farmers and the investigation of local problems. A grant of £12000 has been made for this object.

England and Wales have been divided into eight districts in each of which is situated an Agricultural Department of a University or an Agricultural College, the scientific and technical staffs of which devote themselves to the investigations of difficulties and problems presented especially by small holders.

The Institutions selected up to the present and the areas in which the services of the staffs are available are as follows :

<i>Institution.</i>	<i>Area.</i>
Bedford University	Bedford, Cambridge, Essex, Herts, Hunts, Lincs. (Kesteven), Lincs. (Holland), Norfolk, Northampton, Suffolk.
Gloucester University	Gloucester, Hereford, Somerset, Wilts, Worcester.
Middlesex University College	Berks, Bucks, Dorset, Hants, Middlesex, Oxford.
Anglesey University College	Anglesey, Carnarvon, Denbigh, Flint.
Merioneth College	Brecknock, Cardigan, Carmarthen, Glamorgan, Merioneth, Monmouth, Montgomery, Pembroke, Radnor.
Cumbria College	Cumberland, Durham, Northumberland, Westmoreland.
Yorkshire University	Yorkshire.
South-Eastern Agricultural College	Kent, Surrey, Sussex, Wye.

Special Courses in Forestry are provided at the Universities of Oxford, Cambridge and the University of North Wales, Bangor, as well as at Armstrong College, Newcastle-upon-Tyne, and at the Royal Agricultural College, Cirencester.

Special grants to the amount of £1000 per annum are made by the Government in aid of forestry education provided at the four first-named institutions.

A practical School of Forestry, established in 1904, is maintained by the H. M. Office of Woods, etc., in the Forest of Dean.

A sum of £1200 per annum for two years has been allocated from the Development Fund in aid of forestry research at Oxford, Cambridge, Bangor, Gloucester and Armstrong College, and a sum of £1000 per annum for forestry experiments.

A grant has been made by the Development Commission of £2500 annually for three years for the purpose of providing technical advice in forestry. With this object, England and Wales have been divided into five districts and an advisory officer has been attached to a teaching institution in each district.

The Districts are as follows : Northern, Welsh, Central and Southern, Eastern, and South-Western.

1019 - **The Agricultural Colonial Institute at Florence.** - *Istituto agricolo coloniale italiano*, 13 pp. Florence, May 1913.

The Agricultural Colonial Institute at Florence was founded in 1912 with the object of offering intending colonists the possibility of preparing themselves thoroughly for farming in the colonies. The course of instruction, which lasts two years, is divided into two parts. The first, of a preparatory character, lasts from November 3 to June 30, and the second, or complementary course, lasts from October 1 to June 30.

The curriculum is the following:

First year: Colonial agriculture, general botany, natural sciences in their relation to agriculture, applied mathematics (exercises in map-drawing, valuation and book-keeping), geography and meteorology, French.

Second year: Colonial agriculture, plant geography, systems and diseases of colonial plants, colonial agricultural and chemical technique, colonial farming, climatology and commercial geography, colonial law and history, colonial live stock breeding, colonial hygiene, colonial entomology, English, Spanish or Arabic as desired.

The lectures are completed by numerous practical exercises. After successfully passing the examination at the end of the second year regular students obtain the diploma of colonial agriculture.

In the autumn of 1912, for the first time, a course of tropical veterinary science was held for veterinary surgeons; similar course will henceforward be held regularly. This year the course will last from September 15 to October 14. The course of lectures embraces the following subjects: geography, live stock breeding, entomology, tropical veterinary science, hygiene, accompanied by practical work in bacteriology, and breeding and clinical practice.

In the current year from September 15 to November 8 a high course of colonial agriculture will be held for men already possessing diploma in agriculture. The programme embraces colonial geography, plant geography, colonial agricultural, meteorology, colonial farming and its products, colonial live stock breeding, colonial farming, colonial history, economics and law; precautions against diseases of men and animals in the colonies. Lectures on agriculture and economy in the Argentine. Those students who pass the examination at the end of the course get a special diploma.

1020 - **Agricultural Demonstration Work in the Philippine Islands.** - *Philippine Agricultural Review*, Vol. VI, No. 6 (Demonstration and Extension Notes), pp. 265-302. Manila, June 1913.

A law has been passed by the Philippine Legislature "to establish institutions for practical instruction in matters concerning agricultural demonstration and development".

As 90 per cent. of the farms are of less than 5 hectares (12 1/2 acre) in area, and the vast majority of the Filipino farmers do not read either English or Spanish, a special method of procedure, known as cooperative agricultural demonstrations, has been adopted.

1. *Cooperative demonstration plots on the farms.* — In each place the farmers wishing to benefit from the system become cooperators. Inspectors of agriculture visit the farms and take charge of a plot, which is cultivated according to the best methods, though only by means available to the small farmer. The cooperator gets the benefit of the example and of the increased yield obtained by the improved methods. This system, already adopted in other countries, has everywhere given excellent results.

2. *Demonstration stations* — There will be one of these stations per province; they are the headquarters at which the inspectors are trained to which they return from time to time to keep in touch with the work. They also produce the seed for distribution to the farmers, and will be used for trying new crops; they also carry on demonstrations on a large scale.

For some years the Philippine railway companies, following those in the United States, have been distributing selected seed and other aids to agriculture. The financial results of this are most interesting: thus the freight traffic of Iloilo in three months in 1912 was greater than in the three preceding years together.

The Manila Railroad Company is constructing a special car for agricultural demonstrations. This will take members of the staff of the Bureau of Agriculture from place to place with all the modern material for instruction (lantern projections, improved products, drawings, etc.); leaflets and seed will be distributed free.

— *Provisions for the Trial Year of Tuition for Women Teachers of Agricultural Housekeeping.* — *Ministerialblatt der Königlich Preussischen Verwaltung für Landwirtschaft, Domänen und Forsten*, Year 9, No. 6, pp. 157-161. Berlin, June 1913.

The Ministerial Decree of April 26, 1913, contains the provisions governing the object and the lines of study to be pursued by the women teachers of agricultural housekeeping during the year of probation ordered by the Decree of September 30, 1909, and gives the list of the districts in which the year of probation may be spent.

— *The Work of the Swiss Agricultural Association in the Year 1912.* — *Jahresbericht des Schweizerischen Landwirtschaftlichen Vereins pro 1912*, 70 pp. Brugg, 1913.

The present annual report of the Swiss Agricultural Association for 1912 gives, after a general review of the economic conditions of the country in 1912 and of the work of the Swiss Peasants' Secretariat and of the Farmers' Federation, a table of the branch and trade associations (30 with 26 members) and describes the special work of the Association in the meeting of delegates and sittings of the board, by the diffusion of technical publications, and by the giving of lectures by travelling teachers. It further reports upon the work of the several branch associations, of the commission for the promotion of the cultivation of plants, of the commission for promoting the breeding of pigs and goats. It contains also data on the progress of the Swiss agricultural insurance against accidents, and on the intercantonal seed markets.

1023 - Agricultural Shows.*Austria-Hungary.*

- 1918, Sept. 24 - Oct. 5. Graz (Styria). — Agricultural show of the alpine regions.
Autumn. St. Pölten (Lower-Austria). — Agricultural and industrial show.
Oct. 11-19 Budapest. — Regional horticultural show.

Belgium.

- 1918, Dec. 6-8. Jemeppe-sur-Meuse (Liège). — Second International Poultry Show, org.
by the "Société Avicole" of Jemeppe. Secretary, M. Jos. Ghysens, rue Hôpital
municipal, Jemeppe-sur-Meuse.

France.

- 1918, Nov. 8-10. Troyes (Aube). — Show of chrysanthemums, flowers, fruit and vegetable
season, organized by the "Société d'Horticulture, Viticulture et Fructiculture
l'Aube". Address: M. Lucien Baltet, General Secretary, Troyes.
Nov. 16-20. Paris. — International show of poultry, rabbits, etc., organized by the
Société Nationale d'Aviculture de France". Address to the Office of the Société
rue de Lille, Paris.

Germany.

- 1918, Oct. 7-12. Berlin. — Twentieth German show of barley and hops.

Italy.

- 1918, Oct. 9-10. Morbegno (Prov. Sondrio), Warehouse of the "Società caseari d'Alpi
Cheese show of the Valtellina. An exhibition of cheese-making appliances is also
Address to: "Consorzio pro Gelsicoltura", Morbegno.
1914, March - November. Genoa. — International maritime exhibition. The 5th section
group, includes beverages: dessert wines, liqueurs, vermouths, medicinal wines,
musts, non-alcoholic beverages, brandy, vinegars.
April 15-30. Rome. — Special competition of materials for packing citrus fruits, org.
by the "Società degli Agricoltori Italiani", by arrangement with the Ministry of
culture; annexed to the Second Exhibition of Agricultural Novelties, organized
the same society. Prizes amounting to £ 63, and medals. Address to the
of the Society, Via XX Settembre 8, Rome.

Spain.

- 1914, Spring. Barcelona. — Poultry show.
End of 1914 or beginning of 1915. Barcelona. — International Electrotechnical
Exhibition, organized by the Catalanian Electrical Engineers' Association.

Switzerland.

- 1919, Oct. 10-13. Renens. — Poultry show. Address to the general commissioner, M.
Mayor, Bussigny, Vaud.
1914, Berne. — National Swiss Exhibition (Industrial and Agricultural).

Tunis.

- 1914, April 15-22. Tunis. — International Competition of mechanical ploughing apparatus
open to machines of all systems. A sum of £ 800 to £ 2000 has been allotted for
competition; after deduction of the costs of organization, cartage and fuel, the remainder
will form money prizes for the competitors. Address to: "Direction Générale
de l'Agriculture", 78 Boulevard Bab-Benat, Tunis.

Union of South Africa.

1914. Agricultural shows will be held at the following places:

Feb. 10-11. Robertson. — Feb. 10-12. Britstown. — Feb. 12-13. Worcester. — Feb. 14-15. Calson. — Feb. 18-19. Queen's Town. — Feb. 24-27. Rosebank. — Feb. 28-1. Graaf Reinet. — Feb. 26-28. King William's Town. — March 2-4. Middelburg. — March 5-6. East London. — March 10-11. Molteno. — March 12-13. Aliwal.

— March 12-13. Grahamstown. — March 12-13. Humansdorp. — March 17-20. Port Elizabeth. — March 24-27. Kimberley. — March 31-April 3. Bloemfontein. — April 14-17. Johannesburg. — April 15-16. Oudtshoorn.

United Kingdom.

March 24 - April 4. Earl's Court, London. — International exhibition of the petrol industries; a section will be devoted to petrol motors.

June 24 - July 9. London. — International exhibition of rubber, including cotton, fibres and other tropical products.

Agricultural Congresses.

Belgium.

Brussels. — Sixth International Dairy Congress, organized by the International Dairy Federation. Address to: M. I. Gedoelst, general secretary of the Federation, 15 rue Meyerber, Brussels.

France.

Oct. 14-19. Vernon (Eure). — Annual Congress of the "Association française pomologique" specially devoted to fruits used for cider-making.

Reims. — Third National French Cold-storage Congress.

Spain.

Spring. Barcelona. — Poultry Congress.

Switzerland.

June 8-10. Berne. — Sixth International Congress of the Dairy Industry, organized by the Universal Dairy Association. There will be four sections: Hygiene, Chemistry and Bacteriology, Dairy Economics, General Trade. The papers on the subjects of study will be drawn up and printed in German, French, Italian and English. As these papers are to be distributed to members of the Congress before the 1st of May 1914, they should reach the general secretary before the end of 1913.

United Kingdom.

June 24 - July 9. London. — International Congress of Tropical Agriculture. A section will be devoted to palms and their products.

June. London. — Sixth International Congress of Mining and Metallurgy, Applied Mechanics and Practical Geology.

CROPS AND CULTIVATION.

Soil Moisture Determinations for Cotton. — ROSSON, W. (Curator) in *Report of the Botanic Station, Monserrat, 1911-1912*, pp. 5-6. Barbados, 1913.

A plot of "Sakellarides" cotton, a quarter of an acre in extent, was divided into 4 squares and the diagonal sections weeded weekly and fertilized, respectively. Three series of soil moisture determinations were made at intervals of one month, and three samples were taken from each square. The determinations were made by subjecting the samples to 4 hours of drying at 100°C. After cooling, the samples were weighed, and a further drying of one hour was given. The cotton was planted on August 11, and the following results were obtained.

August	11,	plot hoed weekly	9.52	per cent moisture
"	"	" " fortnightly	10.55	" "
September	19,	" weekly	10.89	" "
"	"	" " fortnightly	10.46	" "
October	13,	" weekly	9.10	" "
"	"	" " fortnightly	9.40	" "

These determinations do not show that there was any gain in moisture resulting from weekly as against fortnightly weeding. The from the differently treated plots was reaped and weighed separately and here again no advantage is shown on account of weekly weeding. The plot weeded weekly yielded 97 lbs. of seed-cotton, and that a fortnightly 98 lbs.

1026 - **The Effects of Calcium and Magnesium Carbonates on some Biological Transformations of Nitrogen in Soils.** — KELLEY, W. P. in *University of California, Publications in Agricultural Sciences*, Vol. 1, No. 3, pp. 39-49. Bellingham, December 14, 1912.

The writer carried out some experiments on a light sandy soil, which after being sieved, was mixed with various quantities of calcium and magnesium carbonate and 5 gms. of dried blood per 100 gms. of soil.

The whole was then placed under optimum moisture conditions, and the amount of ammonia formed after 7 days of incubation was determined. A second series of experiments was carried out with a soil containing a vigorous nitrifying flora, which was mixed with 21 per cent. of dried blood and various quantities of calcium and magnesium carbonate, the nitric nitrogen being determined after 21 days.

The results obtained would indicate that calcium carbonate has a limited stimulating action on ammonification, which is intensified in the case of nitrification. On the contrary, with magnesium carbonate a distinct toxic action was recorded, ammonification being one third less than in the controls, and nitrification being completely inhibited. An antagonism was observed between calcium and magnesium carbonate.

Other observations would indicate that, though these results cannot yet be generalized, before a satisfactory understanding of the time and gnesia question in regard to field crops is presented, it is imperative to have more specific knowledge concerning the effects produced on various soil organisms, especially those connected with nitrogen transformations.

The writer is continuing his research along these lines.

1027 - **Mixed Dressings of Calcium Cyanamide and Nitrate of Soda: Results obtained in Sweden.** — BOLIN, P. (Meddelande Nr. 79 från Centralanstalten för försöksväsendet på jordbruksområdet, Jordbruksafdelningen Nr. 21) in *Kungl. Landbruks Akademiens Handlingar och Tidskrift*, Year 52, No. 4, pp. 276-281. Stockholm, 1912.

The possible advantage of a mixed dressing of calcium cyanamide and calcium nitrate or sodium nitrate and the utility of experiments on this subject has already been discussed (1).

(1) See No. 491, B. March 1912; No. 899, B. June 1912.

The writer carried out some experiments on oats in various parts of Sweden, comparing dressings of 200 kilog. per hectare (178 lbs. per acre) of sodium nitrate, 220 kilog. (196 lbs. per acre) of calcium cyanamide and mixture of 110 kilog. of calcium cyanamide and 100 kilog. of sodium nitrate per hectare (98 lbs. + 89 lbs. per acre). All the plots received in addition 200 . of 20 per cent. superphosphate and 100 kg. of 37 per cent. potash salts per hectare (178 lbs. + 89 lbs. per acre). The mean results of 12 trials were follows :

	Yield in lbs. per acre		Surplus yield in lbs. per acre		Surplus yield relative	
	grain	straw	grain	straw	grain	straw
Control (no nitrogen)	2 327	3 272	—	—	—	—
Sodium nitrate, before seeding	2 572	3 828	244	556	100	100
Sodium nitrate, $\frac{1}{2}$ applied as top dressing	2 616	3 884	289	612		
Calcium cyanamide, before seeding .	2 593	3 780	266	508	109	91
Calcium cyanamide + sodium nitrate before seeding	2 637	3 919	310	647	128	118

Out of the 12 results, 7 were superior to the total mean, and 5 were inferior, the partial means being as follows :

	Yield in lbs. per acre		Surplus yield in lbs. per acre		Surplus yield relative	
	grain	straw	grain	straw	grain	straw
Mean of 7 experiments.						
Control	2 035	3 077	—	—	—	—
Sodium nitrate	2 230	3 525	195	448	100	100
Calcium cyanamide	2 417	3 674	382	597	196	133
Calcium cyanamide + nitrate	2 399	3 795	365	718	187	160
Mean of 5 experiments.						
Control	2 735	3 543	—	—	—	—
Sodium nitrate	3 049	4 252	313	709	100	100
Calcium cyanamide	2 839	3 929	103	386	33	33
Calcium cyanamide + nitrate	2 969	4 090	234	547	75	77

Basing himself on these figures and the general conditions of the experiments, the writer is of opinion that though cyanamide alone may have some favourable influence on the crop, it is not as effectual as sodium nitrate alone and that the mixed dressing is still more effectual than either substance used alone.

Finally, the question as to whether the mixed dressing be an economical one depends largely on the prices of the two manures. With nitrogen worth 1.20 krona per kilog. (7.5 \p^d per lb.) in calcium cyanamide and 1.60 krona per kilog. (10.2 \p^d per lb.) in sodium nitrate, the mixed dressing used in the above experiments would in several cases have effected a saving.

1028 - **The Absorbing Power of some Silicates of Potassium.** (Mitt. aus dem Agrikultur. chem. Laboratorium der Univ. Jena). — BUSSMANN, E. in *Journal für Landwirtschaft*, Vol. 61, No. II, pp. 97-134 + 6 figs. Berlin, 1913.

A large majority of German investigators (Remy, Hiltner, Popp, Wagner, Tacke, Pfeiffer, Soxhlet, Haselhoff, Neubauer, Mach, Krüger, and others) are agreed that phonolite cannot be considered as an equivalent substitute for the Stassfurt potassic salts. Hiltner alone has drawn attention to the fact that phonolite may exert a favourable action on the absorbing and assimilating power of the soil.

In order to investigate the beneficial influence of the silicates of potassium, the writer carried out some absorption trials with powdered phonolite and with "Kalktrassdünger" (product obtained by treating "trass", alkaline trachitic tufa, with lime under steam pressure) and compared them with those obtained with the three following soils: 1) A loam ("Lehm Boden") from Westphalia derived from a sandstone with a clay binding; 2) a clay soil from the district of Jena produced by the disintegration of "Röt" strata (uppermost layer of a mottled Triassic sandstone); 3) a fine alluvium ("Marschboden") containing a high proportion of clay, from the district of Lüneburg. The composition of the five substances employed per 100 parts of perfectly dry substance is given in Table I, and the results of solubility trials in Table II.

The absorption experiments were carried out in 2 series:

a) When the solutions to be absorbed were of a definite concentration (50 gms. of the absorbing material were treated with 200 c.c. of $\frac{N}{10}$ and $\frac{N}{100}$ solutions for varying periods of time).

b) When the concentration of the solutions to be absorbed varied, (50 gms. of the absorbing material were treated with 200 c.c. of $\frac{N}{8}$, $\frac{N}{16}$, $\frac{N}{32}$, $\frac{N}{64}$, $\frac{N}{96}$ solutions for a definite period of time).

The following are the chief conclusions drawn from the results:

I. The absorption of ammonium chloride is considerable in the case of "Kalktrass" and the alluvial clay from Lüneburg, still high in the case of phonolite, poor in the case of the "Röt" clay from Jena, and slight in the case of the Westphalian loam.

II. In weak solutions, potassium is *adsorbed* and in strong solutions it is *absorbed* by all substances, the intensity of absorption being in the

TABLE I.

	Phonolite	« Kalktrass »	Loam from Westphalia	« Röt » clay from Jena	Alluvial clay from Lüneburg
silica	55.55	56.34	83.79	50.00	76.58
humina	19.56	13.61	6.33	16.06	8.37
erric oxide	3.13	2.22	5.24	11.23	6.94
tride of manganese	trace	trace	trace	0.04	trace
lime	1.78	14.10	0.86	9.79	2.08
lagnesia	trace	1.03	—	1.04	3.97
potash	9.41	2.68	1.41	1.16	0.12
soda	9.23	2.83	1.01	1.12	1.48
sulphuric acid	0.91	trace	1.25	0.38	0.42
carbonic acid	trace	7.46	—	9.14	—
phosphoric acid	0.09	0.08	0.25	—	—
reaction	weak alkaline	alkaline	neutral	alkaline	alkaline
water in air-dry substance .	3.79	9.86	3.52	13.04	12.74

TABLE II.

Solvent	Per 100 parts of dry substance				
	Substance treated	Insoluble residue	Silica	Exptd by ammonia	Potash Soda
10% Hydrochloric acid . .	Phonolite	16.85	52.36	19.01	3.04 8.75
	« Kalktrass » . .	20.57	42.67	13.33	2.23 2.62
10% " "	Phonolite	23.52	47.99	18.63	2.09 7.65
	« Kalktrass » . .	35.13	30.87	13.07	2.09 2.38
20% " "	Phonolite	41.86	36.20	17.02	0.71 4.25
	« Kalktrass » . .	50.12	18.94	11.02	0.86 2.09
1% Citric acid	Phonolite	52.54	29.55	16.71	0.09 1.15
	« Kalktrass » . .	64.97	11.27	9.94	0.29 1.15

following order: phonolite, "Kalktrass", "Röt" clay, alluvial clay, loam.

III. Calcium is only absorbed in appreciable quantities by "Kalktrass", probably by superficial concentration; phonolite *absorbs* calcium from weak solutions and *adsorbs* it from strong solutions, while the soil absorb practically none from weak solutions and very little from really strong solutions, the little being in proportion to their clay content.

IV. Nitric nitrogen is never absorbed.

V. The loam soil, phonolite, and the "Röt" clay fix magnesium chemically, at first in large quantities and later in slight quantities. The alluvial clay does not absorb magnesium at first, then absorbs it in considerable amounts and later in smaller amounts. Both the alluvial clay and "Kalktrass" in concentrated solutions yield up again part of their magnesium.

VI. Phosphoric acid is only held chemically; to the greatest extent by "Kalktrass" and to the least extent by the loam. All three soils come below "Kalktrass" and phonolite in order of absorption power.

VII. In the majority of the absorption experiments where strong solutions were employed, the absorbing power remained below the calculated curve of normal superficial concentration.

VIII. In all the absorption experiments, a certain amount of water is removed physically from the saline solutions, so that the absorption figures are slightly too low.

IX. Finally, from a consideration of the relation existing between the soil mass and the quantity of fertilizing substances applied, phonolite and "Kalktrass", cannot be looked upon as a satisfactory means of increasing the absorbing power of the soil.

In connection with these experiments, the writer carried out some other trials on the possible influence of phonolite and "Kalktrass" on the nitrogen-accumulating power of arable soil. The results were positive and showed that an application of phonolite or "Kalktrass" favours in a definite and appreciable manner the conditions of life required by *Azotobacter* in the soil, thus contributing to the enrichment of the soil in nitrogen. But as the total number of factors which contribute to this effect is still unknown, for the present the application of these two materials cannot be recommended in practice. Nevertheless the writer made the following hypothetical calculation: a dressing of 1000 lbs. of phonolite per acre would in 9 months increase the nitrogen content in a layer of soil 8 in. deep by 14.4 lbs. per acre, which would be equal to 68 lbs. of sulphate of ammonia or 89 lbs. of nitrate of soda.

1029 - Present Condition of the Mineral Phosphate Industry at Curaçao (Dutch West Indies). — PENSO, E. (Belgian Consul at Curaçao) in *Recueil Consulaire*, Vol. 124 No. 6, pp. 411-415. Brussels, 1913.

Beds of mineral phosphates abound in the Dutch West Indies (Curaçao, Bonaire, and Aruba), the richest being in Curaçao (85 to

per cent of tricalcic phosphate) and in Aruba (77 to 80 per cent. of calcic phosphate. (1).

At the present time the Aruba beds are being worked, and the product is exported by the limited liability company "Aruba Phosphaat schappij" to whom the Dutch Government has granted the exclusive right of working the beds and exporting the mineral. Transport is effected by steam and sailing ships; in 1912, 20 057 tons valued at £ 10 000 were exported to England, Belgium, France, Italy, the Netherlands, and the United States.

The working of the rich beds in Curaçao was suspended a number of years ago on account of a disagreement between the proprietors and the workers of the beds. The latter undertook all extraction expenses and a royalty of £ 1 on every ton exported; the exports were not to exceed 2 000 tons per annum unless the balance were re-established the following year. From 1875 to 1885 large quantities were exported in this way, and then, prices having fallen, the workers of the beds ceased working altogether on the strength of the above clause and the accumulation of stock exceeded the annual 2 000 tons. The proprietors protested, and the beds were put up to auction and were bought by Hope and Co., bankers of Amsterdam, who formed a limited liability company with a capital of £ 500 000 and paid the colonial exchequer £ 10 312 for all the stock. It is expected that the beds will again be worked in the second half of 1913.

The writer draws attention to the fact that the "Aruba Phosphaat schappij" paid dividends of 700 per cent. previous to the discovery of the Florida beds, but that at present the prices are very low.

- **Distribution of Nicotine in the Leaves of Kentucky Tobacco.** — CICERONE, A. and MAROCCHI, G. in *Bollettino tecnico della Coltivazione dei Tabacchi*, Year XII, No. 3, pp. 119-123. Scafati, May-June, 1913.

The work of d'Errara and of De Toni led to the conclusion that the nicotine in tobacco is located in the epidermal tissue. The writers limited their investigations to the leaves and sought to determine which parts contained the largest quantity of nicotine, using a variety of first class Kentucky tobacco for the purpose. The leaves were dried by direct heating and analysed after having undergone slight fermentation for 4 months in heaps.

In the long axis of the leaf, the median zone is always richest and the apical zone poorest, the apical zone being almost equal to the median zone. The marginal zone is always richer than the central zone. In the rib the nicotine content decreases regularly from apex to base and the rib as a whole contains about two-thirds less than the leaf blade.

(1) See: *Production et consommation des engrais chimique dans le monde*, pp. 8-13, 1913. — O. STUTZER, *Die wichtigsten Lagerstätten der "Nicht-Erste"*, Erster Teil, 9-393, 1911. — K. MARTIN, *Geologische Skizzen über Niederländisch-Westindien*, 1888.

Nicotine per 100 dry matter in various parts of the blade and of the rib

Samples from	Avellino	Monticchio	Caserta	Scalati	Ca Ta
<i>Blade:</i>					
Apical zone.	7.45	5.07	7.46	7.67	71
Median "	7.71	5.31	7.70	7.94	71
Basal "	7.00	3.97	5.72	7.34	51
Marginal "	7.49	5.62	7.75	8.30	71
Central "	6.52	4.24	6.44	7.00	71
<i>Rib:</i>					
Apical zone	2.85	2.16	2.70	3.16	32
Median "	2.17	1.17	1.52	2.47	26
Basal "	1.74	0.66	1.37	1.47	15

1031 - Some Results obtained in Studying Ripening Bananas with the Respiration Calorimeter. — LANGWORTH, C. P. and MULNER, R. D. Nutrition Investigations, Office of Experiment Stations: in *Yearbook of the United States Department of Agriculture*, 1912, pp. 293-308. Washington, 1913.

In order to keep fruits in season for any length of time, it is necessary to be able to retard or accelerate their maturation as the case may require and to prevent subsequent deterioration phenomena. Successful handling of fruit therefore will largely depend on an exact knowledge of the changes involved in the ripening, after-ripening, and decay of fruit, and the causes and the means of controlling them.

The respiration calorimeter (1) offers a new means of studying maturation phenomena in fruit, and the writers record the first results obtained with bananas during the active ripening period. These results show that the ripening changes progress regularly to a maximum; then decline; that at its greatest intensity the heat produced is equivalent approximately to 1 calorie per hour per kilogram of bananas. The heat liberated is a measure of the activity of one or more of the ripening processes. Analysis has shown that during ripening the banana starch is transformed into cane sugar, and the cane sugar into invert sugar, and that there are important changes in the character of the tannin compounds, and that other changes occur brought about by the production of aroma and flavour bodies, and perhaps in other ways. It has also

(1) U. S. Dep. of Agriculture. *Yearbook*, 1911, p. 491.

been found that in addition to the transformation of carbohydrates there is an actual loss of this food constituent during ripening. From the data on oxygen consumption, carbon dioxide production and heat output, it appears that the heat liberated by the ripening bananas is largely due to the destruction of carbohydrate.

Certain experiments now under way will, when completed, permit of conclusions of practical importance being drawn.

232 - On the Presence of Connecting Threads in Graft Hybrids. — HUME, M. in *The New Phytologist*, Vol. XII, No. 6, pp. 216-220. London, June 1913.

The writer examined the graft hybrids *Cytisus Adami*, *Solanum ibingense*, and *Solanum halreuterianum* in order to determine whether the presence of connecting threads between the tissues of the two component plants could be observed. In the case of *Cytisus Adami* their presence had already been demonstrated by Buder (1), and the writer merely confirmed his observation. In the case of *Solanum ibingense*, connecting threads were observed in the stem between the peridermal cells (derived from *S. lycopersicum*) and the underlying layer of cells (derived from *S. nigrum*). The threads were not situated in the cell wall but were usually thinner in those regions perforated by the threads, and the median node of each thread was very marked and liable to split. No threads were observed in *Solanum halreuterianum*, and the writer attributes the failure to faulty material or methods of preparation.

The presence of threads connecting genetically unrelated tissues throws some light on the origin of the threads; they must "arise secondarily, since it is to be supposed that the naked cytoplasm of the two components does not come into contact. At any rate it is clear that the threads cannot have arisen from spindle-fibres, since no nuclei in the two components have ever been sisters."

233 - The Inheritance of certain Quantitative Characters in Tobacco. — HAYES, H. K. in *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*, Vol. 10, No. 1-2, pp. 115-129. Berlin, June 1913.

The Mendelian interpretation of the inheritance of quantitative characters is considerably complicated by fluctuating variability which is due to external conditions and non-inherited. In order to eliminate this factor as far as possible, the writer grew parents at the same time as the F_1 , the P , and the F_2 generation and under similar environmental conditions. If the quantitative character under investigation were inherited in the Mendelian manner, the variability of the F_2 generation should not be greater than that of the parents, while in the F_2 generation it should be greatly increased. Certain F_2 forms should breed true in F_3 , giving no greater variability than the parent types; other F_2 forms should give decreased va-

(1) BUDER, J. Studien an *Laburnum Adami*: II. — *Zeitschrift für indukt. Abstammungs- und Vererbungslehre*, V, 1911, p. 209.

	Year grown	No. of leaves of parents	Range of variation	Total no. of plants counted	Av. no. of leaves per plant	Coefficient of variability
403 (Sumatra).	1910	—	24-31	150	28.2 \pm 0.08	5.27 \pm 0.21
403—I.	1911	29	23-31	125	26.5 \pm 0.11	6.64 \pm 0.28
403—I—I.	1912	29	21-32	151	26.2 \pm 0.12	7.82 \pm 0.32
401 (Broadleaf).	1910	—	17-22	150	19.2 \pm 0.12	5.00 \pm 0.19
401—I.	1911	20	16-22	108	19.1 \pm 0.05	6.54 \pm 0.30
401—I—I.	1912	22	17-23	145	19.9 \pm 0.07	6.08 \pm 0.24
(403 \times 401) ⁽¹⁾ F ₁	1910	—	19-26	150	23.6 \pm 0.07	5.51 \pm 0.21
(403 \times 401)—I F ₂	1911	25	17-32	2 402	22.8 \pm 0.03	9.52 \pm 0.11
(403 \times 401)—3 F ₂	"	24	17-35	1 632	22.7 \pm 0.03	8.99 \pm 0.11
(403 \times 401)—4 F ₂	"	21	17-33	1 958	22.5 \pm 0.03	9.51 \pm 0.10
(403 \times 401)—I—2 F ₃	1912	25	19-29	131	22.5 \pm 0.09	6.44 \pm 0.27
(403 \times 401)—I—3 F ₃	"	26	17-29	186	24.1 \pm 0.10	8.51 \pm 0.30
(403 \times 401)—I—4 F ₃	"	24	18-26	182	22.0 \pm 0.08	7.54 \pm 0.27
(403 \times 401)—I—6 F ₃	"	23	20-28	194	23.9 \pm 0.08	6.61 \pm 0.23
(403 \times 401)—2—1 F ₃	"	21	15-25	188	20.4 \pm 0.08	8.04 \pm 0.24
(403 \times 401)—I—7 F ₃	"	22	17-28	207	21.5 \pm 0.10	10.14 \pm 0.34
(403 \times 401)—I—10 F ₃	"	26	19-27	151	23.5 \pm 0.10	7.83 \pm 0.30
(403 \times 401)—I—12 F ₃	"	25	18-30	209	23.7 \pm 0.14	10.51 \pm 0.41
(403 \times 401)—I—8 F ₃	"	28	19-33	82	26.3 \pm 0.20	10.38 \pm 0.55
(403 \times 401)—3—5 F ₃	"	27	17-28	159	21.7 \pm 0.11	9.45 \pm 0.36
(403 \times 401)—3—6 F ₃	"	28	16-27	229	22.5 \pm 0.09	8.71 \pm 0.26
(403 \times 401)—3—8 F ₃	"	25	17-23	85	20.6 \pm 0.12	8.25 \pm 0.43
(403 \times 401)—I—13 F ₃	"	25	16-29	179	22.5 \pm 0.09	10.84 \pm 0.39

(1) Cross made in 1909. — (2) Rather a high figure for an inbred line and probably due to high manuring and rank growth.

	Year grown	No. of leaves of parents	Range of variation	Total no. of plants counted	Av. no. of leaves per plant	Coefficient of variability
Cuban)	1910	—	16-25	150	19.9 ± 0.08	7.53 ± 0.28
I.	1911	21	18-23	124	20.6 ± 0.07	5.29 ± 0.23
I—I	1912	23	17-25	150	20.9 ± 0.07	6.17 ± 0.24
Havana)	1910	—	17-24	150	19.8 ± 0.07	6.98 ± 0.27
I.	1911	20	16-25	143	20.3 ± 0.10	8.87 ± 0.35
I—I	1912	20	17-22	150	19.4 ± 0.05	4.59 ± 0.18
405) ⁽¹⁾ F ₁	1910	—	15-25	150	19.8 ± 0.07	6.10 ± 0.24
405) — I F ₂	1911	—	14-33	192	20.9 ± 0.16	15.84 ± 0.54
405) — I — 2 F ₂	1912	20	13-29	112	19.7 ± 0.18	14.67 ± 0.67
405) — I — 3 F ₂	"	20	15-22	142	18.4 ± 0.09	8.56 ± 0.34
405) — I — 4 F ₂	"	28	20-35	148	26.6 ± 0.16	11.20 ± 0.44
405) — I — 5 F ₂	"	30	22-34	45	28.8 ± 0.28	10.00 ± 0.20
405) — I — 6 F ₂	"	22	13-29	201	20.1 ± 0.15	16.17 ± 0.56

Cross made in 1909.

ty in F₁ when compared with F₂ generations; and others should be as great variability as the F₂ generation itself.

The subjects of the experiments were two tobacco crosses: Sumatra-Broadleaf and Cuban \times Havana; all these varieties were known to be of a single and uniform type, and the character investigated was the number of leaves per plant from the fourth leaf from the bottom to the leaf below the first sucker at the top, that is to say the number of leaves usually counted.

The results from the Sumatra-Broadleaf family are shown on p. 1364. In 1910 the F₁ generation was intermediate between the two parents in number of leaves, and its variability was about the same. In 1911 the F₁ generation gave a greatly increased variability, and though the three F₁ plants selected as parents differed in the number of their leaves, all gave similar results, showing the variation of the F₁ generation to be non-uniform. Of the 13 selections sown in the F₂ generation in 1912, two showed the same variability as the parents, four are intermediate in variability between the parents and F₂, three show about the same variation

as the F_1 generation, and four show a slightly larger variability than the F_2 generation. The two types which were as uniform as the parents in both of intermediate value as compared with the parents for leaf number.

With the Cuban \times Havana family the same sort of results were obtained (see table, p. 1365).

In the F_2 generation one selection gave a variability only a little higher than the parents, two gave variabilities as great as F_1 , and two were intermediate. It should be noted further that the two selections grown in 28 and 30 leaved parents gave mean leaf values of 26.6 and 28.8 respectively. Thus, by crossing two strains having mean values of about 20 leaves per plant, a new type has been produced with a larger number of leaves.

The writer interprets these results by assuming that in the Sumatra-Broadleaf cross each parent is pure for the same basal condition of 20 leaves and that in addition the Sumatra parent has some inherited properties which result in the production of 26 leaves and which are due to three changeable allelomorphie pairs each inherited separately, the heterozygous condition being half the homozygous condition. In the Cuban \times Havana cross he supposes the parent forms to be represented by gametic values each leaf number of 16 $AA BB$ and 16 $CC DD$, whence F_1 give $Aa Bb Cc Dd$, or 20 leaves, and F_2 a greatly increased variability. The writer points out that these assumptions illustrate the idea, though in actual cross the conditions are more complex, owing to the interaction of a greater number of factors.

1034 - **Cereal Experiments in the Texas Panhandle.** - Ross, J. F. and Leland, J. U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 283, Washington, June 1913.

The so-called Texas "Panhandle" is that part of the State which projects northward between New Mexico and Oklahoma. Formerly land was occupied by large cattle ranges, but these have been gradually replaced by farmers and agriculturists, and for the guidance of these settlers, local experimental stations became a necessity. The first was established at Channing in 1903, and later was moved to Amarillo, where minor experiments have been carried out at two sub-stations.

The district is a high, dry, windy plain from 2000 to 4000 feet above sea-level. The annual rainfall varies from 18 to 23 inches and is irregularly distributed, a large proportion falling in torrential showers so much of the water runs off and is lost to the land.

The atmospheric humidity is low, the evaporation is high, and the frequent fluctuations of temperature occur; sunshine is abundant and the nights are comparatively cool.

A large number of cereal crops have been tried and numerous varieties tested: of the small grain crops, winter wheat has proved on the whole the most profitable, but even in this case the yields are low, do not average 15 bushels per acre. Spring grain gave unsatisfactory results, and maize was quite a failure. But the grain sorghums proved the most dependable crop of all. During the 5 years 1907-11 the average

of all varieties of milo at Amarillo was 23.5 bushels per acre, while of the varieties averaged nearly 28 bushels per acre. The trials have included variations in the time of seeding and in the amount of seed sown per acre, as well as a few tillage experiments, so definite information on the best methods of cultivating the crops is available for those farmers who require it.

- **Manuring Experiments on Cotton in Italy.** — VARVARO, U. in *Le Siasioni sperimentali Agrarie Italiane*, Vol. XI, VI, Nos. 4 and 6, pp. 275-282 and 385-392. Modena, 1913.

During the past few years there has become manifest a distinct movement in favour of the cultivation of cotton in Southern Italy, with the effect of reawakening the interest of farmers in the crop and allowing it to assume once more the place it once occupied in Sicilian agriculture. In 1914 there were 83 650 acres under cotton in Sicily, producing 23 632 tons of lint, while at present the annual production has dropped to about 10 000 tons.

Manuring is usually neglected, though cotton requires a soil which has been well prepared and well manured, and the success of the whole rotation is largely dependent on the manner in which these two processes have been carried out. In fact the cotton plant is a voracious feeder: a good crop of 40 lbs. per acre removes from the soil:

Nitrogen	63 lbs.
Phosphoric acid.	28 "
Potash	59 "

Counting the wheat which follows in the rotation at a proportional rate of 45 bushels per acre, the elements to be returned to the soil per acre would be as follows:

Nitrogen	146 lbs.
Phosphoric acid.	72 "
Potash	115 "

The writer carried out some manuring experiments during the period 1912, at Menfi (province of Girgenti) with the variety "Biancavilla" on a uniform calcareous loam of medium fertility and situated almost on level ground. The plots measured 100 sq. metres ($\frac{1}{40}$ acre approx.) each, and received the following treatment:

Plots	1, 7, 13	no manure
"	2, 8, 14	660 lbs. farmyard manure
"	3, 9, 15	green manuring with beans
"	4, 10, 16	<i>id.</i> + 13 lbs. of mineral superphosphate
"	5, 11, 17	<i>id.</i> + <i>id.</i> + $4\frac{1}{2}$ lbs. sulphate of potash
"	6, 12, 18	<i>id.</i> + <i>id.</i> + <i>id.</i> + $6\frac{1}{2}$ lbs. gypsum.

The fertilizers were applied in November when also the beans were sown; the farmyard manure was spread previously.

The green crop was turned in on February 12th and the cotton seed sown on March 17th.

The returns were as follows :

	No manure	Farmyard manure	Green manuring.	Green manuring. Superphosphate	Green manuring. Superphosphate. Sulphate of potash	Green manuring. Superphosphate. Sulphate of potash. Gypsum
<i>Mean production per acre:</i>						
Total lbs.	648	784	735	865	999	1009
Seed "	183	240	219	251	330	341
Lint "	465	544	516	614	669	671
" %	28.2	30.6	29.8	28.9	33.0	32.1
Time of harvest	Aug. 26 to Oct. 9	Aug. 17 to Oct. 9	Aug. 10 to Oct. 9	Aug. 10 to Oct. 9	Aug. 4 to Oct. 9	Aug. 4 to Oct. 9
<i>Receipts and expenses per acre:</i>						
Total value of production (1) . .	£ 5 7 s.	£ 6 19 s.	£ 6 8 s.	£ 7 6 s.	£ 9 10 s.	£ 9
Total cost of manure	—	£ 3 15 s.	£ 1 1 s.	£ 2 0 s.	£ 3 0 s.	£ 3
Value of unexhausted residue left in soil	—	£ 2 7 s.	5 s.	18 s.	£ 1 7 s.	£ 1
Value of manure removed by cotton crop . . .	—	£ 1 7 s.	18 s.	£ 1 2 s.	£ 1 13 s.	£ 1
Profit due to manuring	—	5 s.	5 s.	17 s.	£ 2 10 s.	£ 2

(1) The prices obtained were: 150 lire per quintal (2.24. per lb.) for the lint, and 5 lire per 100 (22.10s. per ton) for the seed.

The figures and general conditions of the experiments lead to the following conclusions.

I. The application of $12\frac{1}{2}$ tons per acre of farmyard manure raised the yield appreciably and favoured the early ripening of the bolls.

II. The green manuring with beans gave similar, though less marked results; the early ripening however was still more marked.

III. The addition of 5 cwt. per acre of superphosphate to the green manuring increased the yield, showing that the soil requires phosphoric acid.

IV. The further addition of $1\frac{1}{2}$ cwt. per acre of sulphate of potash to dressing again raised the yield and the power of early maturity of the plant, showing that the soil required a supply of readily assimilable potash.

V. The application of gypsum gave no useful results.

VI. The application of all the manures proved remunerative, green manuring together with superphosphate and sulphate of potash heading the list.

Finally, green manuring with beans takes the place of farmyard manure, which is wanting in Sicily, and supplies the soils with the organic matter they lack.

6 - **The Renovation of the Abaca (Manila Hemp) Industry.** — SALEEBY, M. M. in *The Philippine Agricultural Review*, Vol. VI, No. 4, pp. 167-182. Manila, April 1913.

In value and importance the abaca crop of the Philippine Islands is second only to rice, and the necessity of reorganising the former industry on a sounder basis has recently been emphasized by a series of calamities, in the shape of typhoons and drought, which have struck the islands.

The writer points out some of the contributing causes for the present condition and suggests some practical remedies:

1. *Selection of suitable sites.* Plantations should be established on soils where they will receive an abundant rainfall uniformly distributed.

2. *Cultural methods.* Plants should not be set less than 13 feet apart; proper cultivation, which proved most valuable during recent droughts, should be practised, and the land irrigated wherever possible. The renewal of old plantations should not be carried out by setting new shoots between old ones, but by establishing an entirely new plantation.

3. *Improvement of the quality of the fibre.* The following table will show that careful extraction yields a higher percentage of the good quality fibre, whereas a higher percentage of the poor grades is actually extracted:

	Yield with careful extraction	Exported in 1912 —
Low grades	5	32
Current grades	10	40
Good current grades	25	18
Good grades	35	10
Best	25	

The better qualities down to "good current" are put to special exclusive uses; the demand for them is considerably above the supply, and prices are not only very high but very stable, whilst the poorer qualities are forced to compete with other products, showing conclusively the immense advantage of increasing the output of the higher grades. To attain this so long as a good defibrator is not available it will be necessary to concentrate efforts towards improvement on:

4. *The adjustment of relations between buyers and producers.* Producers frequently know of means which would enable them to obtain high quality fibre, but as the local buyers will not pay a sufficiently high price, the planter finds it more profitable to turn out lower grade produce. The buyers or middlemen on the other hand refuse the higher prices partly because, being at the same time merchants, they prefer to keep the poorer class of producers dependent on them and partly because they cannot themselves distinguish between the various grades of fibre and feel safer in buying the lower grades where the differences are more apparent. The writer suggests the following reforms in this connection: 1) the enlightenment of the uneducated class of producers by means of experimental fields, etc.; 2) the formation of planters' cooperative associations; 3) the creation of uniform standards for each quality.

1037 - **A Textile Plant from the Sudan.** — HOUARD, A. in *L'Agriculture Pratique des pays chauds*, Year 13, No. 121, pp. 277-291. Paris, April 1913.

The flower stalk of *Vigna catjang* var. *textilis* ("Kien") yields a fibre which the natives use for making string, but, for the present it is of no economic importance. The writer gives an account of its botanical, agricultural, and commercial character.

1038 - **Cohune Nuts from British Honduras.** — *Bulletin of the Imperial Institute*, Vol. XI, No. 2, pp. 226-230. London, April-June 1913.

These nuts are the produce of the cohune palm (*Attalea Cohune*), native of British Honduras, where it occurs over two-fifths of the area. The yield per tree is about 2 cwt., corresponding to some 2000 nuts.

The kernels, which are rich in oil, are not used on a large scale because of their very hard shells. But as machines for breaking them are now being tried, it seems advisable to determine the characters of the product.

The fibrous covering of the fruit contains an oily substance which may be of value when the kernels are worked.

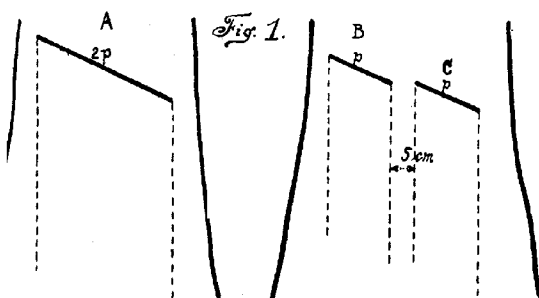
The following figures show the characters of the oil from samples of these nuts received by the Imperial Institute:

	1	2	3	4
Specific gravity at 15°C	0.870	0.871	0.871	0.868
Acidity	3.5	13.1	1.2	20.4
Saponification value	255	256.5	256.5	252.4
Iodine value	13.6	13.7	11.4	13.7
Melting point of the fatty acids	19.8°	21.0°	20.2°	19.7°

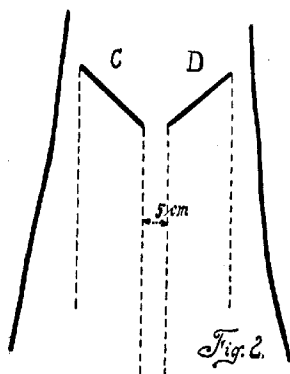
From these figures it is seen that the oil is a good deal like coconut oil. The yield of the kernels in fat is about the same as that of copra. Kernels sent to Europe carefully packed and on a commercial scale should fetch about the same price as copra.

Tapping Experiments with *Hevea brasiliensis*. — DE JONG, A. W. K. in *Mededeelingen van het Agricultuur Chemisch Laboratorium*, No. IV, pp. 1-34. Buitenzorg (Java), 1913.

The writer gives the results of some *Hevea* experiments he carried out at Buitenzorg (Java) to determine the influence of the position and of the incision on the yield of latex:



- 1) Incisions of equal length, made at equal height and in the same position 2 inches apart give practically the same results.
- 2) Such incisions any given number (n) inches apart, and distributed all round the trunk also give the same results.

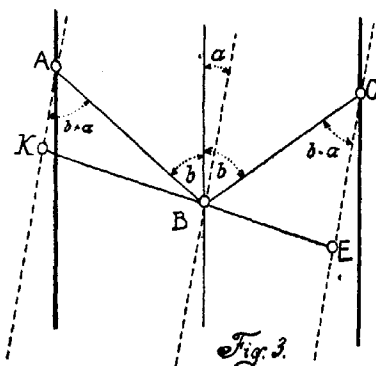


- 3) Considering on the one hand the incision A equal in length to the sum of the two incisions B and C, in the same direction and at the same height as A, each being equal in length to p (so that $B + C = 2p = A$), if the yield for A is taken as 100, two

series of experiments gave 119.7 and 123.9 for B + C, or in other words the double incision gave about 20 per cent. more latex than the single incision.

4) Keeping the other factors constant the writer tapped both to the left and to the right, the incisions being 2 in. apart. To the left-hand tapping, or C, as equal to 100, the right hand tapping, or B, gave 85.7, or approximately 14 per cent. less.

5) The writer also varied the distance between the incisions, which had been constant in the previous experiment, and still the yield of



left-hand tapping was to that of the right-hand tapping as 100 to 85.7, or an appreciable difference in favour of the former.

Interpretation of results. Petch, working in Ceylon, found that left-hand tapping (C, fig. 2) usually yielded more latex than right-hand tapping and suggested the following explanation: the fibres of Hevea are not absolutely vertical, their general direction being that of a spiral rising towards the right hand; the medullary rays and latex tubes are inclined in the same direction, whence in the left-hand tapping the latex tubes are severed and consequently more latex is obtained.

Petch worked with a small number of individuals and the results were repeated the experiments to confirm the results.

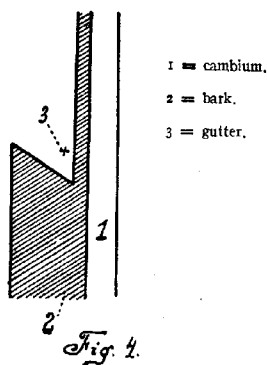
Fig. 3 represents a longitudinal cut of a Hevea, the dotted lines representing the direction of the latex tubes. AB and BC are opposite incisions both forming the same angle β with the direction of the tree trunk and being of unit length; α is the angle formed by the latex tubes with the direction of the tree trunk.

If Petch's hypothesis be correct, the quantity of latex yielded by A B B C will be proportional to the lengths K B and B E (K E being perpendicular to the latex tubes); then

$$\begin{aligned} \text{K B being} &= \sin (a + b) \text{ and} \\ \text{B E } &= \sin (b - a) \\ (\text{since } \text{A B} = \text{B C} = 1) \text{ therefore} \\ \frac{\text{Yield of A B}}{\sin (a + b)} &= \frac{\text{Yield of B C}}{\sin (b - a)}; \end{aligned}$$

known or easily measured; to obtain a value for a , the writer adopted the following methods:

- 1) He removed a vertical strip of cortex and cambium, and opened the wound with a potash solution, when the fibres appeared as lines whose slope could be measured.
 - 2) He first removed a vertical strip of cortex, and then removed the fibres from the tree, but the latter was a difficult process.
- A constant value was obtained for a , and it even varied perceptibly between two points on the same tree, so that the writer was obliged to carry out a large number of measurements on both sides of the tapping experiments. When values were assigned to b and a in the equa-



it worked out approximately true, thus confirming Petch's hypothesis.

As to values for the angle a , the writer gives the following figures: of 316 direction experiments, in 7 cases the fibres had an upward inclination towards the left, in 9 cases they were vertical, and in 300 they had an upward inclination towards the right; the mean for 337° to the right, and extremes varied between 5° to the left and 0° to the right.

During the 9 months' experiments the excess yield of the left tapping over the right-hand tapping, which was 26 per cent. during the first three months, gradually fell to 16 per cent. during the next 3 months and to 12 per cent. in the last three. These differences should be attributed to the inexperience of the coolies who at the start, being accustomed to left-hand tapping, removed too much cortex, and is probable that 12 per cent. most closely approximates the truth.

Conclusions.

1. Petch's hypothesis is a rational one.
2. As a method of tapping, the half herring-bone to the left to be preferred to the herring-bone or half herring-bone to the right.
3. The ideal angle (*i. e.* the one yielding a maximum amount of latex for a minimum of cortex removed) would be at right angles to the latex tubes, but as the incision would then be almost horizontal the latex would tend to run over the side instead of down the cut; to avoid this defect, the writer proposes that a little gutter should be formed (fig. 4) which would enable the slope of the cut to approximate nearly the ideal angle without quite attaining it.

1040 - **Enquiry on *Manihot piauhyensis*** (1). - GIRARD, E. and CAYLA, J. *Journal d'Agriculture tropicale*, Year 13, No. 144, pp. 161-165. Paris, June 30, 1913.

The writers give the results obtained with *Manihot piauhyensis* at An-Loc in Cochinchina.

The trees in question were planted between heveas standing by 33 ft., and were tapped over one-tenth of their circumference by means of five or six herring-bone cuts sloping at 45° and 4 inches apart.

These trees began to be tapped regularly in December 1912, at about a half year old; their circumference at 3 ft. was then 12 to 14 inches. The experiments deal with the period December to March, which is the driest part of the year and corresponds to the slowest vegetative growth.

The mean daily yields were:

Dec. 1912	5.07 grams
Jan. 1913	5.30 "
Feb. 1913	6.75 "
March 1913	7.30 "

The general average is 6.13 gms. of fresh rubber, that is about 4 oz. of dry rubber per day. Reckoning 200 tapping days a year, the yield at two to three years of age would be 800 gms. (nearly 2 lbs.), a very remarkable quantity.

A striking feature is the "formidable" development of *M. piauhyensis* trees at An-Loc: some of those three years old are more than 30 sq. yds. of ground, while in the Serras of Piahy they are quite little trees.

(1) See No. 367, B. April 1913.

is the climate of CochinChina, with its dry season, is similar to that of the country of origin of the manihots, the Asiatic results must be rather to the richness and depth of the plateau soils, and especially to their water-content; indeed the manihot regions of Brazil are not water-less.

The writers consider *M. piavehyensis* the most likely species of manihot owing to its precocity, its yield, and its resistance to drought.

Tea: its Cultivation, Manufacture and Commerce. — CHANDLER, S. E. and E. E. E. in *Bulletin of the Imperial Institute*, Vol. XI, No. 2. pp. 252-319. London, April-June 1913.

The writers give a summary of the cultivation and preparation of tea and then go on to the chief countries producing it.

The world's production in 1912 was about 731 million lbs., distributed as follows (in millions of lbs.):

India	295	Java	63
Ceylon	193	Japan	42
China	112	Formosa	25

A calculation of the consumption per head of population gives 6.2 lbs. for the British Empire and 0.63 lb. for the rest of the world, showing that heavy tea-drinkers the British people are.

British India. — Assam and Bengal make up nine-tenths of the area under tea in India. The progress made since the beginning of tea-growing can be seen by the following figures:

Year	Area under tea acres	Exportation of tea lbs.
1875	—	488
1880	188 000	36 000 000
1912	575 000	264 000 000

The progress is due to two causes:

1) Increase in yield per acre. This varies greatly according to the soil (23 lbs. per acre in Western Bengal and 585 lbs. in Eastern Bengal), but in general it has increased 100 per cent. since 1875.

2) The "tea cess". This contribution, which was voluntary in 1893 and obligatory in 1903, has just been renewed (1913); it has allowed the opening up of important markets for Indian tea in Russia and America. Green tea has assumed considerable importance in the last few years:

1909	2 678 000 lbs.
1911	5 210 000 "

Ceylon. — This is the most important rival of India in the tea trade. The progress made has been remarkably rapid:

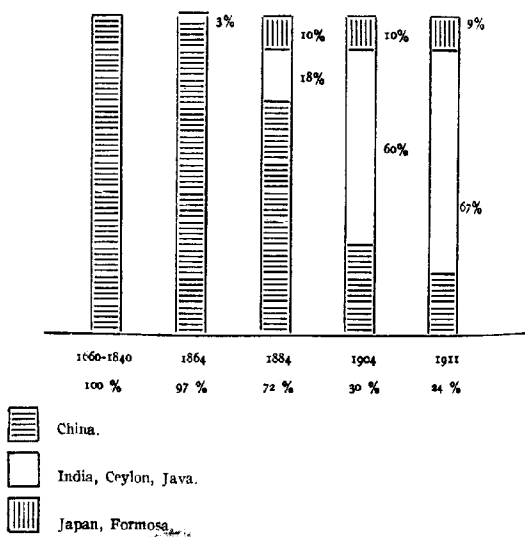
Year	Exportation lbs.
1873	23
1883	1 666 000
1909	192 886 000

For some time the movement has been slowing down, especially owing to the popularity of hevea; it is still, however, the chief crop of island.

Java. — The yields obtained here are very good, but the better qualities are rare: this is probably due to the nature of the soil.

Early on the exportation remained stationary, being 7 029 000 in 1884, and 7 062 000 lbs. in 1890; then it rose rapidly to 15 405 000 in 1900, and actually tripled in the next ten years, reaching 50 518 000 in 1911; there was a still further increase of 20 per cent. in 1912 61 438 000 lbs.

China. — Considering her local consumption, China is probably the largest tea-producer; but on the world's market, formerly entirely supplied by her, China tea only amounts to 24 per cent. at present. The adjoining diagram shows this decrease.



pan. — In Japan, tea is often grown as continuous hedges, of separate bushes; systematic pruning is only carried out every 10 years. In the Uji district, tea is grown under shelters; the product is appreciated, but is all consumed locally. For some years the area under tea has been diminishing, but the production has kept on rising:

1902	56 000 000 lbs.
1911	70 000 000 "

The United States take half this amount.

Ymossa. — The famous Oulong teas are chiefly exported to the United States. Their special qualities seem to be due to: 1) special methods, which are at present being studied; 2) propagation by layers (by example in the world); the best bushes give very little seed, and layers seem to be the only means of keeping all the qualities intact; 3) peculiar method of preparation, having points in common with those of black and green teas.

Trica. — Natal is the only tea-producer of any importance outside the Cape, and its exportation is so far only 2 140 000 lbs. (1911). Lack of labour prevents the extension of this crop.

The Production of Coffee in the French Colonies: its Importance in the Economy of the Mother-Country. — BERTRAU, A. in *Bulletin de l'Office colonial*, 1913, Nos. 64-67, pp. 97-112, 146-157, 186-202 and 209-230. Paris, April-July, 1913. The writer gives the history of coffee-growing in the various French colonies, with many statistics to illustrate it.

Martinique. — After showing the fluctuations since 1835, the writer shows the slight importance of real Martinique coffee on the European market at present.

Guadeloupe. — From 1790 on, this colony was damaged successively by wars, diseases and the abolition of the slave trade; in the last few years it alone has furnished half of the total exports from the French West Indies (1715 000 lbs. in 1910). While in Martinique and the neighbouring Antilles coffee has dwindled almost to the point of disappearing, in Guadeloupe it has shown a slight tendency to rise.

French Coast. — The exports of 1910 (76 450 lbs.) show an increase of 10 per cent. on those of the previous year (64 150 lbs.).

French Congo. — In 1896, of the 9850 lbs. exported, only 295 lbs. were destined for France. But since 1900 almost all the Congo coffee has been exported to the home-country; in 1910 this amount was 106 870 lbs. total exportation of 106 980 lbs.

Madagascar. — The following figures show the progress made: in 1890 the exports were 258 lbs.; in 1903, 3 100 lbs.; and in 1910, 10 000 lbs. The production of this colony is coming to be of importance.

French India. — Between 1830 and 1840, the island exported over two million pounds of coffee a year; various calamities fell upon the island, and exportation in 1910 was only 258 250 lbs.

New Caledonia. — The introduction of small colonisation (with holdings) brought the exportation up to 1 380 750 lbs. in 1903, but ignorance of the planters as regards tropical agriculture reduced it to 651 090 lbs. in 1905; since then, better organization of the coffee plantations has helped matters, and the figure for exports from the colony in 1910 stood at 1 143 700 lbs.

Indo-China. — Coffee seems to do well in this colony, witness the following figures:

1899	770 lbs.
1901	5 117 "
1910	508 835 "

Consumption. — Almost the whole of the coffee from the French colonies is imported by the mother-country, but this amount represents only the *sixty-fifth part* of the total French consumption.

1013 — *Contribution to the Study of Vanilla.* — ADVISE-DESRUISSEAU, *Revue d'agriculture pratique des pays chauds*, Year 13, No. 121, pp. 265-276, Paris, April 1911.

In growing vanilla, it is important to gather the fruits in their optimum state of ripeness, as otherwise the prepared product has a lower market value.

The writer sums up the characters of vanilla ready for preparation as follows:

- 1) whole surface dull;
- 2) both lateral lines yellow;
- 3) the lines below the epidermis yellow or yellowish green, and the whole fruit a slightly yellow tinge of green.

In these conditions: 1) the vanilla is sufficiently ripe; 2) it can be picked at some time, which allows the pickings to be spaced out, so economical in labour; the "yellow tip" criterium is not a guarantee of ripeness, and entails more frequent pickings.

The planter should attempt to obtain a product as heavy as is compatible with quality; the writer has therefore investigated the influence of different cultural methods on the density of the pods. He finds that fruits ripened in the shade are denser than those ripened in the sun; the loss of weight in ripened pods is 4 per cent.

To obtain heavy pods, if the supporting trees will not keep their leaves till after the fruit is picked they should be headed back two or three months after they come into leaf; the physic-nut (*Jatropha Curcas*) is useful for support.

In very moist countries, vanilla ripened in the sun is found to be inferior in perfume than that ripened in the shade. In this case the planter must decide what pays him best.

1044 — *Sophora glauca.* — *The Planter's Chronicle*, Vol. VIII, No. 21, p. 302, Bangalore, June 28, 1913.

Sophora glauca is very abundant in the Nilgiris, Shevaroyes, Coorg, Mysore. The following analysis was made by the Government chemist at Coimbatore

	Per cent. of dry matter	Per cent. of ash
Nitrogen	2.57	—
Phosphoric acid	0.54	9.73
Potash	1.35	24.14

This plant is therefore rich in nitrogen and potash. Mr. Harrison commends it as a green manure for tea and coffee; it is particularly useful when it can be cut in the jungle and brought to the plantation.

45 - **On a Graft-Hybrid between Peach and Almond.** — DANIEL, L. and DELPON, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2000-2002. Paris, June 30, 1913.

In 1905 a vigorous almond tree at Mas-Grenier (Tarn-et-Garonne) as cut back to a short distance above the butt. It threw up a certain number of shoots which were budded in August, when growth had ceased, with buds from a yellow-fruited peach commonly grown in the neighbourhood, which had never shown any variation. The following spring, all the buds grew well, and that autumn there were already some fruit-buds. The following year these flowered at the usual time and gave yellow-fleshed peaches exactly like those of the variety from which the grafts were taken.

In the third year, all the shoots began to change in a curious way. The flowers, though like peach flowers, gave fruits more or less intermediate between peaches and almonds. The flesh was rather thin, soft, tender and coloured like that of the peach, but of distinctly poor quality. The stones were intermediate in varying degree, as regards size, shape and furrowing, between normal peach and almond ones.

A point of interest was that the hybrid shoots did not arise from the graft callus, as usually happens with such occurrences (*Cytisus Adami*, *Craegomyspilus Dardari*, *Pyrocyclonia Danieli*). The grafts bore none of them within a foot of the point of union. Towards the centre of the tree pure peach and almond shoots occurred isolated. There were also here and there fruiting branches of three sorts: pure almond, pure peach, and intermediates. Sometimes a single branch bore both peach and almond leaves. The habit of the graft differed from that of both species; the shoots were more upright and regular and formed an almost hemispherical crown. These phenomena were repeated in the following year, so that the variation was fixed. But as the owner found this curious tree of no use in practice, he destroyed it.

Two stones from the grafted tree have germinated; one of the young trees is vigorous, the other weakly; neither has yet flowered. The leaves show that they have some points of resemblance with both peach and almond. The stipules of the first are large and drop late, as with peach, but the teeth of the leaves are large and regular as in almond; numerous leaf-nectaries are arranged as in peach, and the veins are also like those of peach leaves. The anatomical structure of the petiole and blade recalls that of the almond. The stone of the second tree are deciduous and small, as in almond, but the arrangement of the nectaries and teeth is

like that of peach leaves; the veining is closer, as in almond. The structure of the petiole and blade is about as in the peach.

The characters of the graft-hybrid here described, with leaves, fruits and stones intermediate between those of the stock and the graft, show considerable resemblance to those of *Amygdalus communis persicoides* Ser. of horticultuists; this is considered as a sexual hybrid, but its origin is not really known. It seems more reasonable to suppose that it is really a graft hybrid which has been multiplied without its being known what it was.

Its occurrence at a good distance from the graft-callus shows that graft-hybridization may take place at a varying distance from the union of the tissues, and this agrees with the phenomena recorded by one of the writers in the case of egg-plants and capsicums grafted on tomatoes, as well as with grafted vines. It also recalls the cases recorded by horticulturists a few years ago of pure almond shoots appearing on peaches on almond stock; but in this hybrid the reaction was much more complete, as, besides the pure shoots of stock and graft occurring side by side, there were organs in varying degrees intermediate between the two species (leaves, fruits and stones); in fact it presents a mosaic of poecilodynamic characters, while those previously recorded for peach were mosaics of dichodynamic characters.

1046 - **Olive Growing in Tunis.** - CAMPBELL, C. in *L'Agricoltura Coloniale*, Year VII No. 6, pp. 201-215. Florence, June 1913.

After some information on the conditions of soil and climate under which olive growing is carried on in Tunis, the writer remarks that the botanical and biological sides of the question have not been equally well studied. He gives a summary of his previous publications on this subject. A description is given of the M'gharsa contract, according to which the Arab cultivator takes all the produce of the olive grove for ten years so as to pay the expenses of cultivation; after this the proprietor takes half the produce of the grove, now in full bearing.

The article concludes with the following remarks: 1) the problem of olive growing in North Africa may be summed up in the botanical and biological study of the cultivated and wild olive; 2) large nurseries should be established in various places so as to undertake the selection of trees which will bear without grafting; 3) new varieties should be created for special biological conditions; 4) species of *Olea* that might be useful as stocks should be grown.

1047 - **Manuring of the Carob.** - DI MATTEI, V. *Le piante arboree in provincia di Siracusa*, Part. IV (La coltivazione del carrubo); pp. 81-86. Syracuse, 1913.

The cultivation of the carob in Italy is almost confined to the province of Syracuse (Sicily). In the five years 1890-94, out of a total production of 82 500 tons, 45 000 were produced in the province of Syracuse, and 30 000 in that of Cagliari (Sardinia), the rest in other parts of Sicily and in Apulia. The varieties of *Ceratonia Siliqua* L. grown in the province of Syracuse are: *saccharata*, *laetissima*, *racemosa* and *falcata*.

This Leguminous tree is generally grown in dry and stony ground, associated with cereals alternating with pasture and fallow; but this treat-

nt does not allow it to reach its full yield. Manuring is little practised; to determine its influence the writer started an experiment in the territory of Syracuse, on a plantation 20 years old with marly soil.

Six groups of five equally grown trees were selected; the first dressing was applied on the 21st of October 1908, the manure being spread in basins 8 inches deep over the area shaded by each tree; the second application was made on the 9th of December 1910, and the third on the 2nd February 1913. The amounts applied per group were as follows:

Group	Mineral superphosphate — lbs.	Sulphate of potash — lbs.	Sulphate of ammonia — lbs.	Nitrate of soda — lbs.
I	—	—	—	—
II	8 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{1}{4}$	—
III	8 $\frac{3}{4}$	3 $\frac{1}{4}$	2 $\frac{1}{4}$	—
IV	8 $\frac{3}{4}$	4 $\frac{1}{2}$	2 $\frac{1}{4}$	—
V	8 $\frac{3}{4}$	—	2 $\frac{1}{4}$	—
VI	8 $\frac{3}{4}$	2 $\frac{1}{4}$	—	2 $\frac{3}{4}$

The yields were as follows:

Group	1910 — lbs.	1911 — lbs.	1912 — lbs.	Total — lbs.
I	463	399	817	1 679
II	758	99	1 214	2 071
III	780	97	1 124	2 001
IV	771	346	1 388	2 505
V	551	70	1 159	1 780
VI	577	320	1 102	1 999

In 1909 and 1913 there was no crop, and in 1913 the trees were also severely attacked by mildew (*Oidium Ceratoniae* Comes).

The main conclusion is that the increased yield does not pay for the expense of digging the basins and the cost of the manure; for this reason the writer recommends indirect manuring through the leguminous forage crop grown between the trees. He recommends the following dressed

sing per acre : mineral superphosphate 630 lbs., sulphate of potash 90 lbs., sulphate of ammonia 45 lbs. Manure should also be given if the trees are headed back, as is commonly done.

LIVE STOCK AND BREEDING.

- 1048 - *Schistosomum turkestanicum* Skrjabin¹¹, new Parasite of Cattle in Turkestan. - SKRJABIN, F. K. in *Zeitschrift für Infektionskrankheiten, parasit. Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 7, pp. 457-468. Berlin July 5, 1913.

The parasite found by the writer in the *vena porta* of numerous head of cattle in the Syr-Daria region has a great resemblance to *S. bomfordi* Montgom., but differs sharply from it in the shape of its eggs. These are oval, pointed at their extremities and all of them differing from each other. Their length varies between 0.0725 and 0.0740 mm., and their breadth between 0.0222 and 0.026 mm. By the number of vesicules of the testicles, this species approaches the schistosomes of birds.

Besides being distinguished from other species by the shape of its eggs it differs also in its outer structure (*S. turkestanica* Skj. being sickle-shaped), in the conformation of its male sexual glands and other interior organs.

The writer describes the species very minutely.

- 1049 - On the Presence of Tubercle Bacilli in the apparently Healthy Udder Tissue of Tuberculous Cows. - ISHIWARA, T. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 1-2, pp. 1-9. Jena, July 29, 1913.

The writer examined for tubercle bacilli the apparently healthy udder of 26 very tuberculous cows at the slaughter yard of Munich, and in 19 per cent. of the cases found macroscopic latent tuberculosis of the udder. Considering the small number of bacilli found in the five udders the writer as well as Ostertag come to the conclusion that clinically healthy and mals, even when they give reaction with tuberculin do not pass bacilli into the milk. On the other hand the milk of clinically tuberculous cows, even when the udders appear to be healthy, should not be used unless previously boiled.

- 1050 - Left-Sided Bearing in Cows. - GIOVANOLI, G. in *Schweizer Archiv für Tierheilkunde*, Vol. 55, Part 7, pp. 376-380. Zürich, July 1913.

A description of many cases of left-sided bearing. The writer considers such cases to be of much more frequent occurrence than is generally supposed. According to him, as a rule, cows can bear on the left and the right sides alternately without thereby producing mal-formed calves. If calves borne on the left side are mis-shapen, which need not always be the case, the cause is the confined position in the uterus. The observations of the writer have not confirmed Wundt's opinion that left-sided bearing produces digestive disturbances in cows.

- 151 - **The Correlation between Genital Glands and Dentition.** — ROBINSON, R. in *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2016-2018. Paris, June 30, 1913.

According to the observations made by the writer in the cases of the ass, dog and man (which are described in this work) there is an intimate correlation between the male genital glands and the dental system. If the genital glands are removed early, or their secretion is strictly limited throughout life, the nutrition of the teeth and their consequent development and powers of resistance are superior to when sexual activity commences soon and is continually much exerted.

The writer considers the nutrition disturbances which often occur in the case of syphilitic and tuberculous persons to be partly due to injuries to the reproductive organs. Conversely the entire removal of the teeth in the case of man may cause atrophy of the genital glands, and even occasionally sterility.

- 152 - **Researches Respecting the Boron Content of Milk and Eggs.** — BERTRAND, G. and AGULHON, H. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2027-2029. Paris, June 30, 1913.

According to the analyses of the writers, one litre of human milk contains 0.08 mgm. of boron, while the same quantity of ass' and of cow's milk contains 0.1 mgm. and 0.2 mgm. of this element respectively. In birds' eggs, contrary to what occurs in the case of iron and manganese, boron is localised, not in the yolk, but in the white. The boron content of 1 kg. of the white of hen's, turkey's and goose's eggs is 1 mgm.

The writers conclude that boron, which was found in every analysis, is a catalytic constituent of the animal cell.

- 153 - **The Presence of the Barred Plumage Pattern in the White Leghorn Breed of Fowls.** — HADLEY, P. B. in *The American Naturalist*, Vol. XLVII, No. 559, pp. 418-428. New York, July 1913.

When White Leghorn cocks were crossed with Black Hamburg hens, the resulting F_1 generation were all white, but not pure white however, for every individual had some fleckings, though in some cases the latter were extremely inconspicuous. In a small proportion of birds, both males and females, there were present from one to three wholly barred or more often partly barred feathers. The F_2 generation yielded blacks, greys, whites, plashed whites, and barred birds, the barring in the latter covering the whole body and resembling the marking in the old unimproved Plymouth Rock breed. The proportions in which the different types appeared were as shown in the table on p. 1384.

The Black Hamburg parent could not carry the barring factor unless it also carried an inhibitory factor for barring; therefore the writer assumed that the barring factor (B) was carried by the White Leghorn parent, for which factor it was homozygous as well as for the factor (I) which inhibited the manifestation of black in the plumage. He assumed further that the male was homozygous for the absence of the female sex factor (F) for which the females were heterozygous, and that both parents carried a factor

	Total No.	White	Black			Barred			Grey
			♂	♀	?	♂	♀	?	
1911	117	90	0	9	3	4	2	5	4
Expected	117	$87 \frac{3}{4}$	0	$7 \frac{5}{16}$		$14 \frac{10}{16}$	$7 \frac{5}{16}$		
Expected	117	90		16 (1)			11		
	117	$87 \frac{3}{4}$		$7 \frac{5}{16}$			$21 \frac{10}{16}$		
			♂	♀	?	♂	♀	?	
1912	137	106	0	6	1	14	6	4	
Expected	137	$102 \frac{3}{4}$	0	$8 \frac{9}{16}$		$17 \frac{5}{16}$	$8 \frac{9}{16}$		
	137	106		7			24		
Expected	137	$102 \frac{3}{4}$		$8 \frac{9}{16}$			$25 \frac{11}{16}$		

(1) Includes the 4 grey fowls.

for black pigmentation and a colour factor; but since it seemed probable that none of the birds in the experiment lacked these factors, they could be omitted from the formulae, which thus became $BB ff II$ and $bb Ff I$ respectively.

Lastly, he supposed that in gametogenesis the factor B was repelled by F . Under these conditions the results of mating should be as follows for every 16 birds in F_2 , 12 should be white, 3 barred and 1 black. The white should be equally divided between the sexes; of the 3 barred birds, 2 should be male and 1 female; the one black should be a female. Moreover one of the barred males should be homozygous for this factor, while the other male and the female should be heterozygous. Other birds, including both male and females, should carry the barring factor but not manifest the pattern since they would also be either homozygous or heterozygous for the inhibiting factor I .

The figures given in the above table correspond fairly well with the expected so far as the ratio white to dark of 3:1 is concerned; and with regard to the discrepancy of the barred to black ratio in 1911, the low number for barred birds may be partly explained by the fact that it is impossible to distinguish blacks from barred in very young chicks. In the 1912 re-

ults all chicks which died under 3 weeks old were excluded, and the figures conform closely with the expected. In both years the ratio of barred males to females agrees well with the expected 2 : 1.

Similar evidence with regard to the possession of a homozygous barred character by white Leghorn males was obtained when cocks of that breed were crossed with Black Minorca, Black Java, and Black Spanish hens, but no cross involving the White Leghorn hens has yet been made.

954 - **On Sex-Limited Inheritance in Cats, and its Bearing on the Sex-Limited Transmission of Certain Human Abnormalities.** — DONCASTER, L. in *Journal of Genetics*, Vol. 3, No. 1, pp. 11-23. Cambridge, June 1913.

The question as to whether sex-determination is dependent on the male or the female gamete is still unresolved, as is also the nearly related question of how far sex-limitation is absolute when it occurs, and this in spite of the fact that the hypothesis most widely adopted for the explanation of sex-limited transmission assumes that the sex factor and the factor for the sex-limited character are borne by the same chromosome.

With a view to obtaining fresh evidence on these two points, the writer collected and analysed the data dealing with certain sex-limited affections in man: colour-blindness, night-blindness, nystagmus, and haemophilia. In all four cases, there was an apparent disturbance of the sex-ratio among the offspring of transmitting females, an excess of affected over unaffected males in affected fraternities, and occasional exceptions to the ordinary rule of sex-limited transmission among the children of affected males. However, on further examination it became evident that there were several possible sources of error in the results, due chiefly to the impossibility of distinguishing a transmitting female unless she has at least one affected son. When certain corrections were applied, the excess of affected over unaffected males in affected fraternities was greatly reduced and the existence of this excess was of importance for the purpose for which the enquiry was undertaken, for in some cases at least sex-limitation was not absolute, but was partial like gametic coupling of other characters, and it seemed possible that the excess of affected over normal males among the sons of transmitting females might be due to the partial coupling of the factor for disease with a sex factor among the gametes of the female parent. The factor for the affection as absolutely or almost absolutely coupled with a sex factor in the gametes of the affected male, for he transmitted the factor only, or almost entirely, to his daughters, his sons being very rarely, if ever, affected. If then it were also found that a woman bearing this factor transmitted it chiefly to her sons, there would be absolute sex-limited transmission by the sex, and partial sex-limited transmission by the other sex in the same species.

A basis would thus be provided for a reconciliation of the two types of sex-limited inheritance, exemplified respectively by *Abraxas* and birds on the one hand, and by *Drosophila* and mammals on the other. If this

were the case, the high ratio of affected sons of a transmitting woman should be associated with a low ratio of transmitting to non-transmitting daughters; the material examined gave no evidence that this was the case, but as mentioned before the available data were too incomplete to lead to any definite conclusions about the nature of the transmission of these human abnormalities.

On comparing the summary of the human pedigrees with data collected on colour inheritance in cats, it appeared probable that the latter might be able to throw some light on the question, as the transmitting female in this case is visibly different from the non-transmitting.

Orange colour in the cat was taken as analogous to abnormality or to the sex-limited affection, while black corresponded to normality. The orange colour is dominant over black in the male but only partially dominant in the female, so that the female heterozygote is tortoiseshell. In general, an orange male mated to a black female gives black male and tortoiseshell female kittens; in the converse cross, orange female by black male, the male kittens are orange, the females tortoiseshell. The orange male thus usually transmits orange to his daughters only, the orange female transmits it to all her offspring of both sexes. A tortoiseshell female by black male gives orange and black males, tortoiseshell and black females; showing that a female heterozygous for orange transmits the orange factor to some kittens of both sexes.

A summary of the results of over 100 matings showed their similarity to those obtained in the case of the human diseases. In the offspring of the orange male mated to black female there was some excess of females (61 ♀ : 50 ♂), as is also the case among the offspring of males affected with disease, while in the offspring of tortoiseshell females by black males there was a considerable excess of males (67 ♂ : 35 ♀). Further there was evidence that the sex-limitation of the orange character by the male was not absolute, and that there was an excess of transmitting over non-transmitting daughters (21 : 12). The numbers are small, and further data are required before they can be regarded as significant, but they give no support to the suggestion that the excess of affected males was due to partial coupling of the factor for the affection with a sex-factor in the gametes of the transmitting female.

Until more data are collected, it seems of little value to attempt to express the facts in a factorial scheme, but certain suggestions are made towards such a scheme, and an indication is made of the experiments which would be necessary to verify the hypothesis in so far as coat colour in cats is concerned.

1055 - Three Years' Work of the Ferndale Cow Testing Association (California).

— ANDERSON, L. In *Agricultural Experiment Station, Bulletin No. 233*, pp. 457-461. Berkeley, California, September 1912.

The first Cow Testing Association in the United States originated in Michigan in 1905, and four years later the above Society was organised at Ferndale in Humboldt County, California. The latter's results for the

t three seasons are now available and present some interesting figures: Approximately 600 cows have been under control and the average yield of milk rose from 5 900 lbs. per head per annum in 1909 to 6 890 lbs. in 1911, while the butter fat yield increased from 251 lbs. per head per annum to 291.5 lbs. in the same time. Each member pays from 80 cents (4d.) to 1 dollar (4s. 2d.) per cow per annum and the tester receives dollars (£12 10s.) a month besides board and lodging and travelling expenses. The cows are tested once a month, but so far no attempt has been made to control the food consumed, as the animals are pastured during three quarters of the year.

5 - **The General Show of Breeding Stock, Paris, 1913.** — VACHER, MARCEL in *La Vie à la Campagne*, Vol. 14, No. 163, p. 63. Paris, August 1, 1913.

The writer gives a short review of the successes attained by different breeds of cows, sheep and pigs in this year's show and compares results with those obtained in previous years. He bases on the writer's suggestions of the improvements which should be aimed at in breeding.

- **Inheritance Studies at the Royal Stud of Trakehnen (East Prussia).** — SCHMIDT, BRUNO in *Arbeiten der Deutschen Gesellschaft für Züchtungskunde*, Part 15, pp. 1-359. Hanover, 1913.

The royal stud of Trakehnen, which was established in 1732 by the amalgamation of scattered studs, was at first Crown property, and as such was entrusted with the duty of breeding the saddle and carriage horses required by the court of the king. The stud became State property after the death of Frederick the Great, and only attained importance in horse breeding when its stallions were employed for promoting the breeding of native horses and then the Littau breeding depôt was established for this purpose in 1787. Since then the Trakehnen stud has been the centre for producing the Prussian pedigree half-breeds. According to the writer, the different breeding stations form a large homogeneous stud founded by the chief stud of Trakehnen. If we examine the pedigrees of the stallions which were used for service shortly after its establishment, we find the most different blood represented; it is therefore to be concluded that systematic breeding was not practised at first. Of the stallions imported up to 1749, 19 were of unknown origin, 5 were English, 5 Rosenburger, 1 Berber, 1 Neapolitan. Nevertheless, it appears that already at this time the Trakehnen products were good pedigree horses. Especially suitable for this purpose were the descendants of a white Persian stallion, *Persianer*, used for breeding from 1739 to 1747, of his son *Spinola*, and the offspring of the bay stallion, *Pitt*, the Champagne trotter. The writer considers that these three stallions, which he has traced in the pedigrees of a large number of first-class breeding animals, are the founders of the old Trakehnen breed. Systematic breeding was introduced for the first time by Count Lindenau. The general inspector of horse-breeding appointed in 1886, devoted special attention to increasing the number of brood mares and eliminating hereditary faults.

He had scarcely acquired the necessary stud of brood mares, when a broke out in Prussia, causing a period of inaction and retrogression in breeding operations at Trakehnen. While towards the close of the eighteenth century there was a growing tendency to cross pure bred Arab horses with continental breeds, at the commencement of the nineteenth century, Arab horses were increasingly replaced by English Thoroughbreds. Let English half-breds also began to be imported.

Nevertheless, von Burgsdorf, who was Inspector General from 1813 to 1843, was not decided as to the best method to be adopted, for he gave preference first to pure-bred Arabs, then to English Thoroughbreds, afterwards using Arab stallions again and finally deciding in favour of English Thoroughbreds. More noticeable progress in breeding was made when Schwichow, who was Inspector General from 1847 to 1864 and aimed crossing for increased vigour. When he had attained his object, he tried to improve the breed by the introduction of pure blood ("Veredelung"). From 1860 almost all the imported stallions were noted English Thoroughbreds. At the present day, there is once more a tendency to limit the use of Thoroughbreds.

While giving a rapid review of the development of the stud, the writer also mentions the results of investigations made respecting the composition of the blood ("Blut Aufbau") in the families of the best stallions. By means of pedigrees, which are in part reproduced in the text, he shows which stallions have founded families, how long and for what reasons their descendants of the said stallions have been used for breeding and the influence which they have exerted. The writer has studied 23 lines of stallions in this way.

The analysis and the comparative study of the pedigrees show that the best breeding results were obtained by in-breeding, and that at Trakehnen an effort was made as far as possible to unite the best lines of the stud blood, *i. e.* to improve the blood. Those families which were no longer inbred maintained their position on the stud books for a relatively short period compared with the others.

Valuable families were also rejected owing to fashion in coat colour and other reasons. Many stallions did well and founded families only because they were mated with suitable mares, while others with faultless pedigree and upon which great hopes were built, retired from the breeding and without leaving any traces of their blood because they had not been provided with fitting mates.

At the end of this chapter, the writer deals briefly with the changes which have taken place on the breeding stock at Trakehnen in the course of time. Though the latter was heterogeneous at the commencement, it consisted of Slav, Danish Mecklenburg and Oriental blood, the breed gradually developed, thanks to the introduction of English half-breds and Thoroughbreds, and has produced a type characterised by constant homogeneity and race purity. This has, however, been accomplished only by always using first-class stallions, endeavouring to eliminate original differences without introducing others, and by practising improvement of the

ed ("Blutveredlung"). If the large amount of good blood in the Trakmen horse is not visible at first sight, this is due to the fact that, at present, the principal object in breeding is to obtain a stronger frame.

The following chapter treats of the formation of blood in the mares' families. The writer deals with 20 out of 400 families, basing his observations on their pedigrees. In the case of mares, as in that of stallions, it is noted that the best blood is obtained by inbreeding. Good results are also produced by crossing and subsequent systematic selection of those individuals which, by a happy combination of circumstances, prove to be of value.

The next chapter treats of the inheritance of coat colour. The writer gives a summary of the work of Dr. Crampe on this subject, and then attempts by means of examples to explain on Mendelian lines the inheritance of coat colour.

White is dominant over all other colours in horses; a white horse can only be obtained if one of its parents is white, but white horses when crossed do not always produce white offspring. Chestnut is always a recessive colour. Bay is recessive as regards white and dominant as regards chestnut.

It is however not possible by means of Mendel's theory to foretell which colour will prove dominant. According to the writer, more light is thrown upon this question by an examination of the animals' pedigrees; he cites instances of great power of coat colour transmission taken from breeding records of Trakmen and based on colour pedigrees. Conforming to the opinion of Von Öttingen, the writer considers that a black coat can be transmitted with a fair amount of constancy. The writer attributes the presence of white hairs to the use in in-breeding of white horses.

In conclusion, the writer has examined all the Trakmen breeding material from the point of view of the transmission of hereditary defects. His observations have led to the conclusion that a pathologic fold of the eye is hereditary. The transmission of this defect seems to be more marked on the maternal line. At Trakmen, periodic opthalmia was found to be hereditary in some cases, and not in others. The writer considers that this is hereditary and can be transmitted by animals which have not the disease.

Roaring was also proved to be hereditary. Spavin, navicular disease (sole) and broken windedness were not transmitted. The writer, however, notes that the two first diseases can be transmitted by animals which are much affected by them. It seems that there may be a predisposition to paralysis. The text is accompanied by many portraits of horses of the best lines.

- Crisis in Saddle-Horse Breeding in the South and South-West of France. - L. RAYNAUD, M. La Crise du Cheval de selle dans les Charentes. — *La Vie Agricole Rurale*, Year 2, No. 31, pp. 128-129. Paris, July 5, 1913. — 2. COURRÉGELONGUE, M. La Crise du Cheval de selle du Midi. — *Ibid.*, pp. 130-131.

There has been, for some years past, a considerable decrease in the number of saddle horses bred in the South and South-West of France.

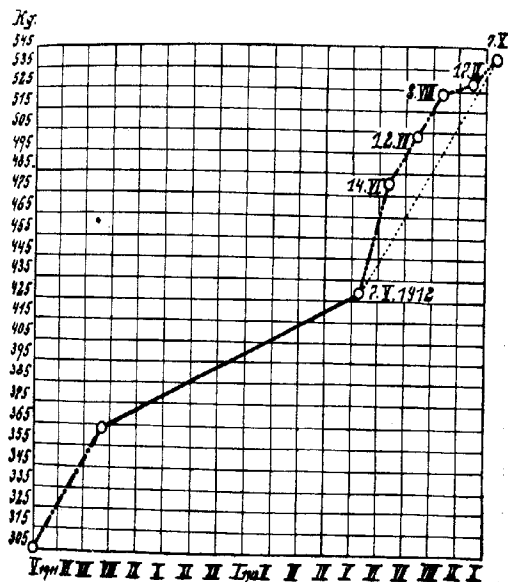
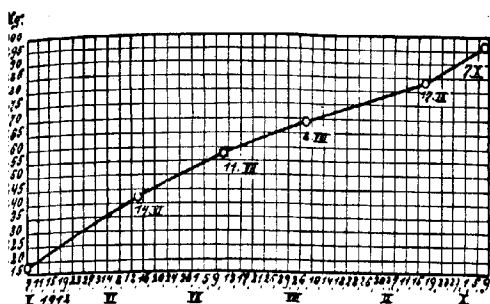
Between 1904 and 1909, the number of saddle horses bred decreased by 32 per cent. (mares 40 per cent.) in South-West France, 26 per cent. in Central France and 35 per cent. in the Vendée and the Charentes. On the other hand, there was an increase of 4 per cent. in Morbihan of 20 per cent. in Côtes-du-Nord and of 53 per cent. in Finistère.

The chief reasons for the decline of the industry are, according to the writers, the increase in cattle, sheep and mule breeding, and especially the unremunerative nature of breeding remounts. In the South of France, a three and a half year old saddle horse costs the breeder on an average £53 10s, while the Remount Department has hitherto seldom paid more than £38 for such an animal. Thus the breeder loses £15 on the transaction. Should the horse not be purchased by the Remount Department, the loss is still heavier, since the State is the best customer. Seeing the great importance of saddle-horses in the South and South-West of France, both for the army and for agricultural purposes, the writers recommend the adoption of the following measures for encouraging horse breeding.

1. The distribution of the State premiums in proportion to the number of horses bred for the army by each region.
2. The increased purchase of three-year-old remounts and the raising of the price of remounts.
3. The granting of premiums to breeders who retain the best brood mares for their own use. There should be three classes of prizes (£12, £8, £4) according to the value of the mares.
4. The giving of an annual prize to the breeder each time a mare in his possession is in foal which has been served by an approved State stallion.
5. The organisation of saddle-horse shows after the pattern of the general cattle show held annually in Paris.

1059 - **The Results yielded in 1912 by the Pasture for Young Cattle at Laine near Bayreuth, Bavaria.** — *Lex in Deutsche Landwirtschaftliche Tierzucht*, Year No. 27, pp. 327-328. Hanover, July 4, 1913.

The Laineck pasture belonging to the Herdbook Society of the Bayreuth red and white breed (Simmenthal type), has an area of 117 $\frac{3}{4}$ a, and is divided into eight enclosures, and in 1912 it supported 126 head of cattle varying in age from 7 $\frac{1}{2}$ months to 2 years and 7 months. The grazing season began on May 7 and ended on October 9. The grazing dues amounted to 36s 3d for cattle under 20 months of age, and 41s for those above this age. In addition to the cattle, the pasture supported about 20 foals, and also yielded a little hay and aftermath. The calves and foals remained day and night in the open, and were only housed in the sheds during the cold September nights. No extra food was given. The health of the animals was good. The cattle were weighed before being driven up, as well as every four weeks during their stay, and two days before leaving the pasture. They were also measured at the beginning and end of the grazing season. The results obtained were



- Increase in weight of cattle grazed for one season.

- Increase in weight of cattle grazed for two seasons.

Explanation of fig. 2.

--- Increase in weight during the 1911 grazing season.

— Increase in weight during stall-feeding in winter 1911-12.

--- Increase in weight during the 1912 grazing season.

Only in the case of 15 animals was the increase below 110 lbs. accompanying diagrams show the increase in weight of the animals. The increase in the withers height was:

The increase in the withers height was:

cm.	1	2	3	4	5	6	7	8	9	10	11
number	2	15	7	10	25	16	14	16	4	2	1

The chest depth increased:

cm.	1	2	3	4	5	6	7	8	9	10
number	2	4	5	10	26	27	20	9	16	5

Increase in girth (chest):

cm.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
number	1	3	1	3	1	4	4	6	5	7	5	9	6	7	9	5	11	5	1	9	7	3	3	0	1	1	1

The Illinois Experiment Station has recently closed an 84-day test with Western yearling wethers. The object was to determine the value of different roughages for fattening sheep. Eight lots of 10 sheep each received rations as follows: Lot 1. Shelled corn (maize) and alfalfa. Lot 2. Shelled corn and alfalfa, corn silage. Lot 3. Shelled corn, corn stover and corn silage. Lot 4. Shelled corn, corn stover and linseed meal. Lot 5. Shelled corn and corn stover. Lot 6. Shelled corn, straw and corn silage. Lot 7. Shelled corn, oat straw and linseed meal. Lot 8. Shelled corn and oat straw.

For making gains, the lot receiving shelled corn and alfalfa and one receiving shelled corn, alfalfa and silage were superior to any other but these gains were made at a cost per pound exceeding that of other lots, except those receiving corn, oilmeal and oat straw, corn and oat straw. Corn and oat straw made a very poor ration the end of the feeding period, the animals receiving this ration were the most part inferior in market condition.

The adding of linseed oilmeal did not pay.

Silage added to the shelled corn and oat straw ration gave a ¹⁰⁰ finish practically equal to that where alfalfa was used.

Oat straw supplemented with silage made a slightly better ration than corn stover and silage both in extent and cost of feeding. To the feeder with a silo this has a practical significance, as oat straw is more convenient to handle, and corn stover requires a large amount of labour in cutting up.

However, when silage is not available, corn stover is a better roughage to use with shelled corn than oat straw. Corn stover and shelled corn were far superior to corn stover alone.

The results show that silage is a valuable ration in fattening sheep and lambs when judiciously fed. In no case was it fed in large quantities, the reason that it was not possible to get the sheep to consume a large amount of it.

1 - **Irish Pig-Feeding Experiments.** - SPENCER, SANDERS in *The Farmer and Stock-Breeder*, Vol. XXVI, No. 1234, p. 1012. London, May 19, 1913.

The first reported experiment was said to be entered upon to ascertain whether pigs could be profitably fattened without potatoes. The six pigs used for the experiments were divided into two lots of three each. The first lot were fed on equal parts of Indian meal and pollard for 122 days; the second lot were fed on potatoes and on equal portions of Indian meal and pollard. The increase in weight of the two groups was nearly the same, but was a little superior in the case of the first. Calculating the cost fetched by the animals and the cost of their food, it appears that, at the average price of marketable potatoes in Ireland is more than \$2 per ton, a mixture of Indian meal and pollard costing 8s. per cwt. would generally be a more profitable pig-fattening food than a mixture of the two foods named. The experiment gives no conclusive data, as no mention is made of the percentage of dead to live weight, or of the quality of the meat.

The second experiment was carried out for the purpose of comparing the values of barley meal and maize in the fattening of pigs. In this case also six pigs divided into two lots of three were used. The experiment lasted 76 days. The first lot were given maize, potatoes and skim-milk; the second lot received barley meal and a similar addition of potatoes and skim-milk. The pigs in lot 1. appear to have made a greater increase by 7 lbs. each than the barley-fed lot, but this small variation does not seem to have influenced the reporter greatly, since it is recorded that "the difference in the results from the two foods was so slight that may be assumed that barley meal is as satisfactory a food for pigs as Indian meal, and it possesses the advantage that it can be produced on the farm".

Similar experiments having the same objects in view were carried out in Co. Cork, but the details given are fuller, and the number of pigs larger.

In the first of the two experiments, eight pigs were utilised; they were cross-bred Large Yorkshire pigs, presumably the offspring of a boar of this breed out of locally bred sows. The eight pigs were divided into two lots of four animals each. From November 12 to the beginning of January the first lot was fed on potatoes, barley and separated milk, while the second received potatoes, maize and separated milk.

The total increase in weight in the two lots was about the same, while the proportion of dead weight to live weight was 74 per cent. in the case of the first lot, and 75.4 per cent. in that of the second.

A second experiment was carried out, also with eight pigs; no separated milk was given, the animals being fed in the first case on potatoes and maize meal and in the second on potatoes and barley meal.

The daily increase of weight was larger in the pigs given bar meal. The animals showed a decided preference for the latter and would have consumed larger quantities of it than of maize meal. The subsequent examination of the meat showed that, as a rule, the flesh of barley-fed pigs is firmer and of better quality than the meat from pigs fed on maize. Mention is also made of the fact that some of the pigs fed on maize meal suffered from so-called cramp (1), whilst those fed on barley meal were unaffected.

1062 - Tests of the Performance of Goats belonging to the Goat-Breeding Societies of Brüggen, Harsum, Schüttorf and Wessenstedt, Hanover, V. in *Zeitschrift für Ziegenzucht*, No. 9, pp. 130-133; No. 10, pp. 149-151; No. 13, pp. 206-208; No. 14, pp. 213-217. Hanover, May and July 1913.

These milking tests were begun in March 1911 and carried on to the assistance of the Prussian Ministry of Agriculture, Domains and Forests (Preussische Ministerium für Landwirtschaft, Domänen und Forsten). The number of goats tested was 10 for each Association. The first milk test was made 7 days after the kids were dropped, the others every 7 days until only half the goats were still milking. Three goats of each Association were milked three times a day, the rest three times at subsequent only twice. The Wessenstedt goats were all milked three times at first, and afterwards twice.

The yields of milk and of fat were determined. For the milk, volume was determined and the specific gravity of 1.032 taken as a basis for the calculation of the weight. The butter yield was estimated by multiplying the fat content by 1.1.

The total results of the milking tests are given in table I.

TABLE I.

Breeding society	Breed	Number of times the animals had kidded	Length of observations			Yield of milk			Fat content			Butter yield	
			days			lbs.			%			lbs.	
			Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum
Brüggen	Harr, fawn-coloured, hornless	2-10	280	308	291	1180.7	2031.0	1612.6	2.97	3.28	3.00	53.38	91.79
Harsum		2-7	255	315	296	7357.4	2501.2	1977.8	2.98	4.78	3.63	51.81	100.10
Schüttorf	Seane,	3-8	238	294	266	932.1	1580.0	1199.0	2.32	4.07	3.17	31.91	69.94
Wessenstedt	white	2-8	224	294	272	1324.0	2147.9	1712.0	3.11	4.36	3.54	52.86	81.52

(1) In the countries of Southern Europe, where maize is fed on a large scale, it does not appear that this disease is of especially frequent occurrence.

These data show that the highest yields were furnished by an Association-keeping Harz goats, and the lowest by an Association breeding goats. On the other hand, if the total results are taken into account it is clear that the Harz goats cannot be assigned a higher place than the Saane breed.

Table II gives the average milk and fat yield of the goats which were milked three times a day.

TABLE II.

Average milk yield: lbs.			Average fat content: %		
morning	noon	evening	morning	noon	evening
3.21	1.82	2.16	3.22	4.28	3.64

In regards goats which were milked thrice daily, the decline in yield occurred between the first and second series of observations, was in the proportion of 100: 82 in the case of milk, and of 100: 78 in that

the case of the Wessenstedt Association goats, which were milked thrice during the course of the first observations, and twice during that of the second, the decrease in the yield of milk and fatty matter was in the proportion of 100: 85.

Table III gives the average production of milk and fatty matter on different test days.

TABLE III.

Milk lbs	Fat %	Test day	Milk lbs	Fat %	Test day	Milk lbs	Fat %
7.3	4.906	8	7.0	3.481	15	4.4	4.217
7.9	3.962	9	6.6	3.441	16	4.2	4.051
7.7	3.578	10	6.2	3.204	17	3.7	4.233
7.9	3.549	11	5.9	3.333	18	3.3	4.394
7.9	3.403	12	5.7	3.427	19	3.1	4.450
7.5	3.525	13	5.3	3.771	20	2.6	4.989
7.3	3.672	14	4.9	4.023	21	1.8	5.040

In order to definitely decide whether, and in what manner, the yields of the goats, and therefore the number of times they had kidded, influenced the yields, the experimental animals were divided into three classes. In the first were placed the goats which were in their second or third lactation period, in the second those in their fourth or fifth, and in the third those animals which were in their sixth or further period of lactation. It was found that the average results were about the same for all three classes. It thus appears, that there is little difference between the milk yield of younger and older goats.

The test showed that the capacity of goats for milk production is an individual property; that these animals are able to utilise to a high degree the food they consume, and that, in their case, there is no definite relation between the amount of milk produced and its fat content.

1063 - **Ostrich Farming in America.** — NIELSEN, N. (Report presented to the Government of New South Wales) in *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 5, pp. 397-401. Sydney, May 2, 1913.

Ostrich farming in the United States is confined to Arizona, Southern California and portions of Texas and New Mexico, for the birds are very sensitive to cold and these are the only regions in the States which possess a sufficiently warm and dry climate all the year round.

In California the farms situated near the large cities such as Los Angeles and Pasadena are used almost as much for show places as for the production of feathers and derive a large portion of their income in that way. Under these circumstances the area of the farms is necessarily somewhat restricted and the birds have to be fed artificially. In Arizona, on the other hand, large tracts of land formerly used as cattle ranches have been turned into ostrich farms where feather production is the sole object, and where the birds are kept under the most favourable conditions possible and in enormous colonies up to 5000 head on one farm. The land is divided up into main "run paddocks" or enclosures and smaller feeding paddocks. The former are large, varying from 100 to 180 acres in extent; to each are attached 5 or 6 feeding paddocks varying from 6 to 10 acres each according to the size of the adjacent run paddock, and making up together a total area equal to one third of that of the run paddock. The feeding paddocks all run alongside the main irrigation ditch of the property in order to have an available water supply both for the use of the birds and for irrigation purposes; they are sown with leguminous crops or cereals, commonly used in order to provide green food all the year round, and the birds are only allowed into one or two at the time. Run paddocks are sown with some hardy perennial grass and rarely irrigated, but if watered, these, as well as the feeding paddocks, are allowed to dry well before the birds are turned on again.

The greater number of birds in the Arizona farms are of South African stock and type, but it has been recently demonstrated that a cross-fusion of Nubian or Red-necked blood has increased not only the



Fig. 1.
Fowler-Wyles motor plough.

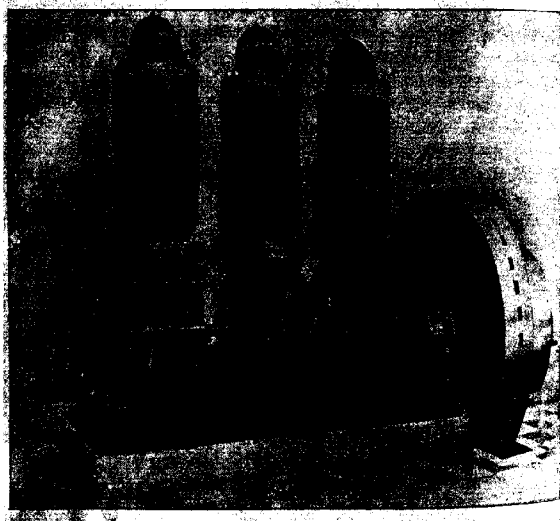


Fig. 2.
Pitter's semi-Diesel engine.

stamina of the birds, but also their capacity for producing valuable feathers. All plucked feathers are roughly sorted on the farms by girls; they are then tied up in bundles weighing from half a pound to one pound and sent to New York, where they are dressed for the market. As a result of his observations the writer was led to believe that large tracts of land in New South Wales would be eminently well adapted to the requirements of this industry.

FARM ENGINEERING

Engines and Agricultural Apparatus Exhibited at the Show of the Royal Agricultural Society held at Bristol, 1913. - *Engineering*, Vol. 96, Nos. 2480, pp. 18-22 and 40-44. London, July 4 and 11, 1913. - *The Engineer*, Vol. 116, Nos. 3001 and 3002, pp. 10-12 and 37-40. London, July 4 and 11, 1913. - *The Implement and Machinery Review*, Vol. 39, No. 460, pp. 505-551. London, August 1, 1913.

These three accounts contain detailed descriptions and figures of some of the exhibited agricultural machines which showed various innovations and improvements in their construction.

Especially worthy of note are the motor ploughs and traction engines of the following firms: Messrs. John Fowler and Co.; The International Harvester Company of Great Britain; Messrs. Aveling and Porter; Darbyshire Motor Plough Syndicate; Messrs. Marshall Sons and Co.; Messrs. Forster and Co., and The Ideal Agricultural Motor Company.

Fig. 1 represents the newest type of the Fowler-Wyles motor-plough with a one-cylinder paraffin or petroleum motor. Fig. 2 shows a Pettet cylinder 150 H. P., Semi-Diesel engine.

Messrs. Davey Paxman and Co. exhibited gas engines. Oil motors were shown by Messrs. Brazil, Straker and Co.

Many milk separators and machines for food preparation were on view. Prizes were awarded for milking machines and sprayers. The first prize for the former was given to the "Amo" machine constructed by the Aktie-bolaget Mjolkningmaskin Omega, Flen (Sweden). The second prize was given to the milking machine of Vaccar Limited, London. Both these machines are Swedish inventions. The "Amo" is a suction machine. The vessel holding the milk is hung over the cow's back on an adjustable band. It is to be noticed that the milk passes into the milk vessel through four celluloid, and not indiarubber, tubes. The milking machine exhibited by Vaccar Limited is worked by a pulsator.

Among the sprayers, the first prize fell to the "Green" powder sprayer of Messrs. Moellenkamp and Co., London, and the second to the "Pilter" powder sprinkler of Messrs. Pilter and Co., London.

1065 - The Machines and Implements at the Exhibition of the German Agricultural Society at Strassburg, 1913. - 1. KÜHN, G. in *Maschinen-Zeitung*, Year Nos. 13 and 14, pp. 153-161 and 166-172. - 2. PITTS, F. *Ibid.*, No. 15, pp. 178-180. Berlin, July 1 and 15 and August 1, 1913. - 3. *Landwirtschaftliche Maschinen-Geräte*, Year 13, Nos. 22 and 23, pp. 15-35 and 15-23. Artern, May 31 and June 7, 1913.

The exhibition catalogue contained nearly 8000 exhibits, exclusive of those shown in the pavilions set apart for the chief and the preliminary trials (1). The number of exhibits being large, only some novel ones are mentioned in this account. A turn-wrest plough with a new device for easy adjustment of the head, was exhibited by the plough maker I. G. Dobler of Landsberg. The Finnish firm of G. Svanljung exhibited a new model of their harrow with rotating teeth (*Rollspatenegge*).

The ploughing machines were the centre of great interest, and were very numerous in view of the chief trial organised by the German Agricultural Society for motor ploughs during the current year. In order to facilitate inspection, these machines were divided into three groups according to their method of work, and regardless of the fuel used:

1. Mechanical ploughs on the winding drum principle.
2. Mechanical ploughs with direct traction.
3. Picking machines (*Bodenfräsmaschinen*).

The first group consisted of the steam ploughs of the firms A. Vent & A. G. of Grandenz, John Fowler and Co. of Magdeburg, the Heilmann Machine Manufacturing Co., and a plough drawn by a cable driven by an explosion motor, shown by the firm of F. Kners of Tegel. No electric outfits were exhibited.

A compound steam ploughing engine driven by super-heated steam with a boiler of a new construction was shown by the firm A. Vent & A. G.; this machine, though it is rated by its constructors at 90 H. P., and can for a time attain 130 H. P., only weighs 13 tons. The decrease in weight will facilitate the management of the machine. Its price is £ 1000. The same firm exhibited a steam balance plough with a soiler of a new type. Messrs. F. Kners of Tegel showed a mechanical plough worked on the two-engine system; these engines have four bevel wheels, can reverse, and have four cable speeds. The length of the cable is 1500 ft. The amount of benzol used in normal work is, according to the makers, 9 oz. per horse-power hour. The ploughing-tackle weighs 16½ tons and the total price is £ 1075.

The tractor ploughs were more numerous. In this class are included those machines in which the motor and the body of the plough are mounted on the same framework and those in which the plough is dragged by a separate tractor.

(1) The machine trials organised by the German Agricultural Society on the occasion of these exhibitions fall into two classes, the chief and the preliminary trials (*Haupt- und Vorprüfungen*), of the new machines. The latter are placed in special pavilions and trial pavilions.

Stock motor plough in the chief trial pavilion showed many improvements upon the earlier types. Other motor ploughs exhibited the Wendeler-Dohm type and those of the International Harvester (Lincoln) and the Holt Caterpillar Co. (Budapest).

The "Akra" plough of the "Aktien Maschinen-fabrik Kyffhäuserhütte" is a Stock type but larger. The four-cylinder benzol motor has a cylinder diameter of 8 in., a cylinder diameter of 6 in., and a maximum force of 85 hp at 750 revolutions per minute. Its weight is 6 tons and its price

A new liquid-fuel motor, used for the traction of ploughs or roads, was exhibited by Messrs. John Fowler and Co. of Magdeburg. The weight of this is 9 tons and its catalogue price £ 1040.

The picking machines were represented by the exhibits of Messrs. of Mannheim; the "Studiengesellschaft für Landbaumotoren"

h) and the "Siemens-Schuckert" Werke (Berlin). The "Lanz"

e of the Kőszegi type is constructed on a new system. The four-cylinder benzine motor gives 60-70 H. P. with about 580 revolutions per

The "Factotum" machine of the Munich "Studiengesellschaft für Landbaumotoren" has a new type of roller. The latter carries 6 rows

of rollers, which are not rigid, as in the case of the Lanz-Kőszegi plough, but revolve round a point. The price of this machine is £1250,

the same as that of the "Lanz" machine. The trials made with the Lanz system ploughs which were also exhibited proved very

interesting. The smaller weighs 15 cwt.; it has a 10-12 H. P. motor and costs £250. The larger is of 25 H. P.

Amongst the other exhibits were numerous manure-distributors, sprayers, thrashing machines and dairy machines and utensils.

Trial of a New Self-guiding Two-Wheel Plough with Subsoiler. (Fortieth report of the Machine-Testing Department of the Brandenburg Province Chamber of Agriculture). — FISCHER, G. in: *Mitteilungen des Verbandes landwirtschaftl. Maschinenversuchs-Anstalten*, Year 7, Part 2, pp. 48-55. Berlin, 1913.

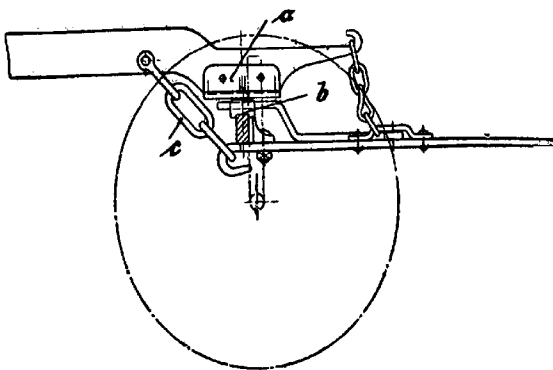
The plough described in this report was used on the estate of Dahlemburg, Berlin, on the Hellersdorf estate belonging to the city of Berlin, and on the Uetz estate (Osthavelland). During the time that this plough was used (1911-1912), the Department for Machine Testing had the opportunity of testing it more than once.

The new wheel-plough is chiefly characterized by a new appliance for self-guidance (see figure). The beam rests by means of a cast-steel roller (a) upon the saddle (b) of the axis of the fore-carriage to which it is attached by a short chain (c). The construction is such that the support plate, under the influence of the different degrees of resistance offered by the soil, can rise on the round saddle, while the chain placed between the beam obliges the latter to resume its former position. The simplicity of the new plough is the simplicity of its construction. Another feature in which it differs from ordinary wheel-ploughs is that a spring roller is attached to the beam to break up the bottom of the open furrow. The mould-board of the plough must naturally be adapted to the soil conditions; that used during the trials was suitable to a moderate

ately compact soil. The mould-board is made of soft steel. The wheels of the fore-carriage have replaceable boxes on the nave.

This new plough, of which eight have been made, costs, including coulters and reserve share, from £2.2s to £4.10s. Skim-coulters and subsoilers are reckoned separately; the first, with spare share, costs from 8s 6d according to the size of the plough; the price of the second, including the attachment, is from 10s to 28s.

As a result of the tests and a prolonged trial on the three abovementioned estates, it may be said that the plough worked excellently when the right-sized machine was selected, it fulfilled all the demands

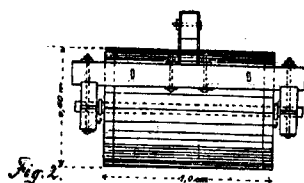
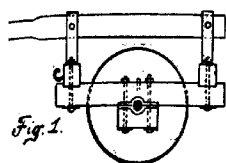


made upon it. Particularly noticeable is the simplicity of its construction, the facility with which it is managed and guided, and also the fact that this plough also serves the purpose of breaking up the subsoil. Wheel-ploughs of this type have only been in existence a few years. In the new plough the subsoil share is narrow, as, in the opinion of the constructor, this type requires a minimum of traction force and has a better influence upon plant growth than a broad one. The truth of this statement is being tested in different places, but the experiments, which will extend over many years, are not yet finished.

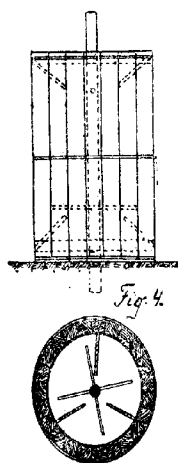
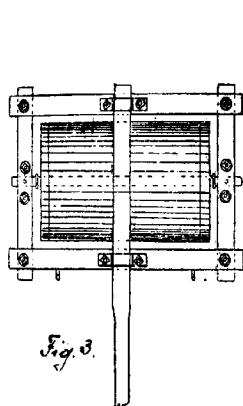
Their results are, however, only of secondary importance as regards the judgment to be passed on the plough, for the advantageous use of breaking up the subsoil has long since been demonstrated in many ways. As the transformation of the plough into a subsoiler only costs a few shillings, and the machine works equally well in both capacities, technical perfection is already worthy of recognition.

Reinforced Concrete Rollers for Use on Moorland Soil (1). *Stenger in Der Kulturtechniker*, Year 16, No. 3, pp. 237-239. Breslau, July 1, 1913.

It is well known that rolling the soil has a great influence upon the of moorland crops and is especially important in laying down mea-



and pastures. Unfortunately, rolling is too little practised and is times entirely omitted. The reason for this is, almost invariably, high price of an iron meadow roller. It is thus well to draw the



ion of the agriculturists to rollers made of reinforced concrete, they can construct themselves on the spot, selecting the weight suitable for their purpose.

igs. 1-3 give such a roller n s de and front elevations and plan. er of this kind 3 ft. 3 in. wide weighs, without the iron parts and

shafts 1230 lbs. for a diameter of 24 in., 1700 lbs. for a diameter of 30 in., and 2800 lbs. for a diameter of 36 in.

Construction of the mould and of the roller. — A circular piece of wood of the diameter of the roller is placed level on the ground. Through the centre is passed the axle, which must project 8 in. at each end beyond the cylinder of reinforced concrete. It may consist of an old cart axle or of a cylindrical bar of iron, of 2-inch diameter. In order to ensure adhesion of the cement to the axle, and to prevent the latter from slipping independently of the roller, it is transfixed, 16 inches from each end, by rods of iron which project perpendicularly; the middle of the axle is also notched. On the circle of wood an iron hoop of the same diameter as the roller is placed. This hoop protects the edge of the latter, and is furnished internally with three twisted bands of flat iron plates which pass obliquely into the mass of concrete. Vertical lathes are now nailed round the wooden bottom, or else are bound round it with wire. The upper portion of the cylinder formed by the lathes, there is placed a second iron hoop similar to the first and 3 ft. 3 in. from it; this is fastened to the lathes by iron wire so that it cannot shift. After the roller has been centered exactly, the mould (fig. 4) thus prepared is ready for use in the concrete. The concrete should be made with as little water as possible, using 1 part of cement to 3 or 4 parts of washed gravel.

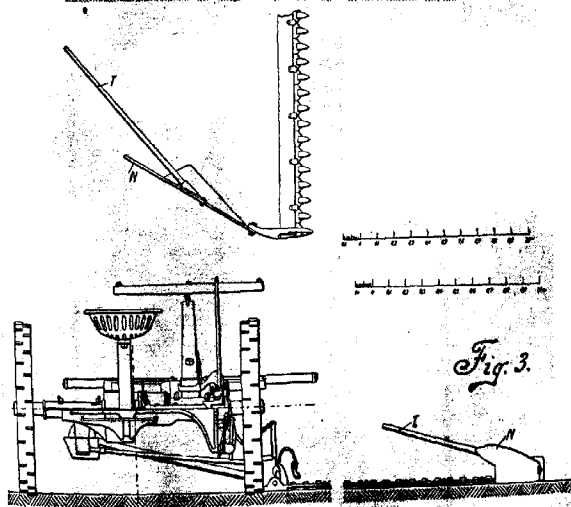
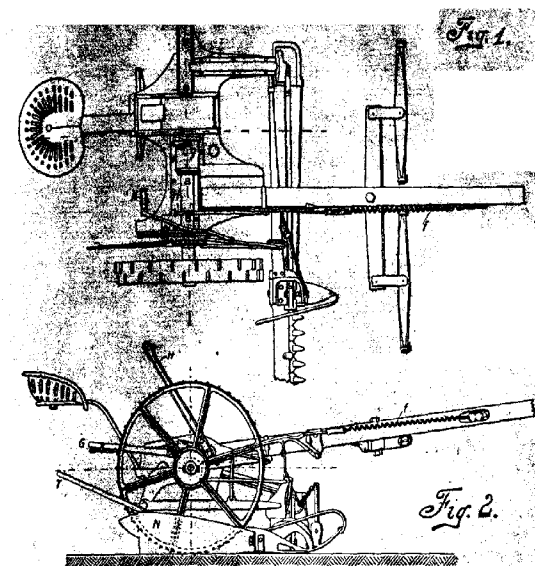
The concrete must be rammed in in layers of about 8 inches, and the ramming of each layer should go on till water appears on the surface. The mould being thus filled, it is left in the shade for two or three weeks, care being taken to water it frequently. At the end of this time the wires and lathes are removed, the surface is smoothed over with iron and subsequently the concrete roller is laid on its side. Then follows the construction of the deal frame, shown in figs. 1-3.

A roller of 24 inch diameter and 3 ft. 3 in. long costs, when made at the spot, £3 15s. A long roller is unsuitable for moorland soil, on account of the difficulty in turning.

1068 — *Trial of an Eight-Foot Grass-Mower.* — NACHTWEH, A. (Ninth Report of the Testing-Station for Agricultural Implements and Machines, at Hanover) in *Zeitschrift des Verbandes Landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, 2, pp. 71-83. Berlin, 1913.

In fig. 1 the grass-mower is represented as seen from above, as in fig. 2 the side view is given; the drawings are to scale. *H* is the lever which raises the carrier of the finger-bar, which is released by the spring *f*. The lever, *G*, serves to fold back the mowing apparatus upon itself, while *K* represents a foot-lever which can be used alternately for the same purpose. The finger-bar is 8 ft. long and has 31 sections.

In fig. 3 the mower is drawn as seen from behind; this shows particularly the shoe *N*, at the end of the finger-bar; by means of its elongation, *I*, the shoe can easily be taken hold of to help in raising the finger-bar.



Eight-foot mower.

Owing to its great length, the finger-bar would be apt to bend a ; this is obviated by its being bent slightly upwards in such a per that when in a horizontal position, it becomes perfectly straight gh its own weight. In order to give great stability to the mower, wheels are placed very far apart and the gear for working the knives uated between the two wheels.

This machine was tested on the meadow of Empelde near Hanover, many agriculturists made the first and second cuts with it. They ed very satisfied with the work of the mower, and were especially essed by the large amount of work it performed, and its light run-

The official trial was made in a field at Empelde belonging to Fricke, many measurements being taken and dynamometric experi- s carried out. Longer tests were effected to decide the two follow- joints.

1. The force expended in traction.

2. The adaptability to slopes.

The results obtained in both cases were excellent. The writer gives s showing the width of the cutting and the amount of traction force red. The blade was examined as regards its cutting diagrams ittdiagramme) according to the Nachtweh method.

The mower weighs 760 lbs. and costs £22.

The conclusions drawn from the trial are as follows: as a result of many tests made during the summer of 1912, this machine may be ded as completely fulfilling all practical requirements; it is very , possesses great stability and does a large amount of work.

- Trial of an Automatic Feeder for Threshing-Machines. — NACHTWEH Fenth Report of the Testing-Station for Agricultural Implements and Machines, at (anover) in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 2, pp. 83-86. Berlin, 1913.

The trial in question took place on the 5th of April 1913 on the dts estate at Appensen, near Bevensen. The automatic feeder was to a threshing-machine whose drum was 67 inches in length and $\frac{1}{4}$ inches in diameter. The chief part of the feeder is a toothed ving shaft; it bears arms carrying at their extremities two angle situated somewhat apart from each other. The teeth are fixed nately on these angle irons and pass through slits in the sheet iron r, which is supported by two braces. The quantity of sheaves taken y the toothed rotating shaft is regulated by special fingers.

Owing to the late date only rye and wheat were available for hing. In a trial with rye, the amount threshed in a quarter of an was observed; this was 757 lbs. of grain, which would mean about shels (of 56 lbs.) per hour. Wheat was then tried; in one hour shels (of 60 lbs.) were got through. As the guaranteed average ut is 25 to 30 bushels per hour, the trial may be considered satisfactory.

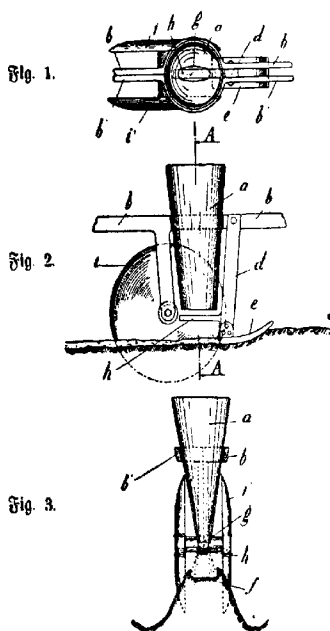
The working of the automatic feeder is also excellent. The exam- ; committee was satisfied that the amount of grain threshed was in

no way diminished by using it, so that it may be considered altogether satisfactory.

Before a final judgment is pronounced on the thresher and fan it is intended to submit them to extensive trials with various crops this autumn.

1070 - **Drill for Beet Seed.** (German patent No. 251-386). — *Blätter für Zuckerrüben* Year XX, No. 12, pp. 188-189. Berlin, June 30, 1913.

The usual drills for sowing beet seed in clusters are not well adapted for sowing on the ridge, as the clusters frequently fall off the compe



tively narrow crest of the ridge into the furrows. For this reason the subject of the present patent is provided with a couler, in front of the sowing funnel, which traces a flat-bottomed depression along the crest of the ridge, ready for the seed to fall into.

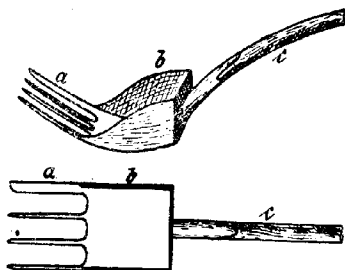
Fig. 2 gives a side view of the apparatus, and figs. 1 and 3 view from above and in front (partly in section). Between the two supports (bb') of the funnel of the distributor (a) is the stanchion (d) which supports the couler: this is about 2 inches wide and bent back to give

bottom; it leaves a flat-bottomed depression (*f*, fig. 3) into which the seeds fall.

The distributor (*h*) is situated below an oval opening (*g*) in the bottom of the funnel, and is supported by the stanchion (*d*). To prevent seeds getting too much scattered, or carried away by the wind, two wing discs (*i i'*) may be fixed on, one on either side of the funnel.

- **Combined Fork and Shovel.** — DE CONDÉ, G. in *Journal d'Agriculture pratique*, Year 77, Vol. II, No. 28, p. 57. Paris, July 10, 1913.

The handling of litter of very short material with a fork is an arduous job: this is so with very short straw, peatmoss, sawdust, leaves,



etc. On the other hand, the wooden shovel used for sawdust will do for other material used to replace straw as bedding.

These difficulties are done away with by using the combined fork and shovel shown in the figure. This tool, which is easily made, is a four-pronged fork, with the right hand prong (*a*) generally wider than the others. The back part is solid and forms a shovel (*b*) with a handle (*c*). The length of the prongs may be varied.

- **Trial of the Lawrence-Kennedy-Gillies Milking Machine at the Livestock Institute at Reggio Emilia (Italy).** — CUGNINI, A. in *L'industria lattiera e casearia*, Year XI, Nos. 8-13, pp. 132, 152-153, 168-169, 185 and 200-203. Reggio Emilia, April 15, May 3 and 19, June 1 and 15 and July 15, 1913.

The trial of the above machine was carried out in 1912 under direction from the Ministry of Agriculture. The writer first gives an outline of the development and working of mechanical milking apparatus. The machines belong to two groups, milking respectively by suction and by pressure: the former imitate the action of the calf's tongue in sucking, the latter the action of the milker's hand. The principle machines of the first group, which include a suction-pump worked by a motor of about 1000 watts, are:

Lawrence-Kennedy-Gillies.
 Burrell-Lawrence-Kennedy.
 Max.
 Wallace (1).
 Dana.
 Thistle.

Those of the second group, in which pressing parts do the work,¹²

Alfa-Dalen.
 Loquist.
 Sans-Rivale.
 Galakton (2) (3).

The trials, made on ten cows divided into two lots of five, were intended to examine the following points:

1. Fixing and working of the machine.
2. Influence of mechanical milking on the health of the animals.
3. Completeness of the action.
4. Quality and quantity of the milk.
5. Time required for milking and manual labour involved.
6. Cost of installing the machine.
7. Hygienic qualities of the milk.

Besides these two lots, which were used specially to determine the effect of mechanical milking on the quantity and quality of the milk, some other cows were machine-milked.

The experiments were divided into a preliminary period of 30 days to fix the rations, the weight of the animals and the milk-yield, and an observation period of four months, in which the cows of lot I were machine-milked and those of lot II hand-milked as control.

The writer gives details as to the rations, and then turns to the working and manipulation of the machine.

The apparatus is accurately and strongly constructed; during the whole trial period none of the metal parts got out of order, and the only parts requiring renewing were some of the rubber tubes. The handling of the apparatus is very simple. With regard to the health of the cows there was nothing unusual to report.

The completeness of the milking has a marked influence on the quality and quantity of the milk, as well as on the occurrence of affections of the udder. Tables given by the writer show the details of this. It appears

(1) See. No. 170, B. Feb. 1913.

(2) See No. 169, B. Feb. 1913.

(3) Further information on these milking machines, as well as on the "Revalo" "Bergner Revalo", "Andersen-Schmidt", "Delta", etc., may be found in the following publications: *L'Industria lattiera e zootecnica*, No. 17, 1912; *NELLO FORTICOMA "La mungitura meccanica"*, *Ibid.* 1909-10; *Deutsche Landwirtschaftliche Presse*, 1909, 1911, 1912; *La Vie agricole et rurale*, 1912; *Journal d'agriculture pratique*, 1910, 1911, 1912; *Bulletin de la Société des agriculteurs de France*, 1912.

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t between the 1st of July and the 15th of October the total amount milk drawn by the machine was 9 967.5 lbs., while the amount milked hand to complete its work was 766.1 lbs. or 7.14 per cent. of the total milk. The data on the quantity and quality of the milk are also given in table. In the preliminary period the yield of the two lots per head day was almost equal, namely 27.90 and 27.24 lbs. In the experimental period the average yield of lot I was 20.98 lbs., as compared with 23 lbs. for lot II. The time taken to milk each cow was 15 minutes by the machine, as against 8 minutes by hand.

The following table shows the cost of installations :

For	60- 80	cows, with 3	pulsators	£	1 20
"	80-100	"	" 4 "	"	" 1 50
"	100-130	"	" 5 "	"	" 1 95
"	130-160	"	" 6 "	"	" 2 25
"	160-180	"	" 7 "	"	" 2 55
"	180-200	"	" 8 "	"	" 2 90

After treating at length of the milk, the writer sums up his conclusions follows.

1. The working of the apparatus presents no difficulty, and its manipulation is easy.
2. Almost all cows allow themselves to be milked without difficulty from the first; only a few need a short time to get accustomed to method.
3. The milking machine in question had no deleterious action on general health of the cows; two of them showed slight hardening of hind quarters of the udder, but this soon went off.
4. The apparatus did not milk dry, and hand stripping was necessary in every case.
5. Machine milking, supplemented by hand stripping, had no appreciable depressing influence on either the quantity or the quality of milk.
6. For all the cows, machine milking was slower than hand milking.
7. It appears that on large dairy farms the number of milkers can be reduced by using several of these machines; but the total number of cows required seems hardly to be lessened.
8. The expenses incurred in machine milking are certainly not lower than with hand milking.
9. To obtain proper hygienic conditions in the milking, scrupulous cleanliness in the apparatus is essential.

- **Milking Machines: Effect of Machine Method of Milking upon the Milk Flow.** — SMITH, G. A. and HARDING, H. A. — *New York Agricultural Experiment Station, Bulletin No. 353*, pp. 327-361. Geneva, N. Y., November 1912.

The Burrell-Lawrence-Kennedy milking machine has been in use at New York Experiment Station since 1907 and has been continuously used against hand milkers by dividing the herd as far as possible into two

equally productive halves, and subjecting each cow alternately to hand and to machine milking during her successive lactation periods. The milk flow is subject to so many fluctuations that the results cannot be taken as in any way conclusive, but so far as they go they do not indicate any depressing effect on the yield by the use of the machines. Two cows, one small teated and the other very hard milking, which could not be milked by hand, gave satisfactory returns with the machine. It was calculated that one man with two machines could attend 15 cows.

1074 - **Improved Universal Desiccator for Drying Potato Slices, Beet Leaves, Cereals, Beet Seeds, etc.** - Voss, H. in *Deutsche Landwirtschaftliche Presse*, Year No. 55, pp. 672-673. Berlin, July 9, 1913.

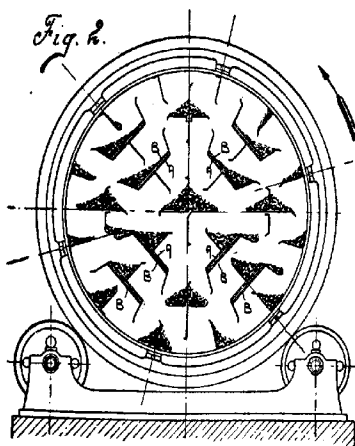
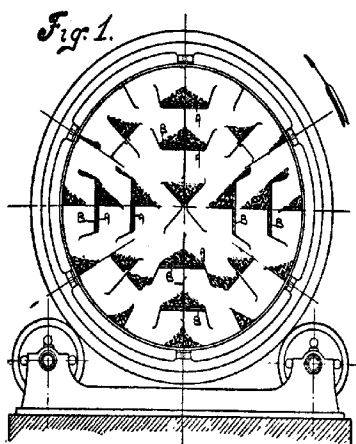
With the present desiccators, not only potatoes, mangolds, cereals, beet-seeds and peas can be successfully dried, but also beet leaves, potato haulm, etc.

The best and most extensively used are the drum desiccators with rotatory mechanism in which hot gases straight from the generators can be used for drying.

The drum desiccator of the "Tätosin" system, thanks to the revolvable revolving apparatus in the interior of the drum, can be employed for drying every kind of agricultural and industrial product, provided that the latter is suitably prepared. The apparatus (figs. 1 and 2) consists of a revolving cylinder, in which perforated cups (A) are placed one above another. These cups possess movable perforated lids (B) through which the substances to be dried find their way from the outer zone to the middle of the drum and back. This is of great advantage in ensuring equal drying and permitting the utilization of the hottest gas given off by the generators.

Product	Fuel used	Temperature of the gases		Speed of hot gases in the drum in ft. per sec.
		on entering C.	on leaving C.	
1. Potatoes with 18% starch	Coke only	550	200	3.3-3.6
2. Beet leaves reduced to one-fifth of their weight when dry	Coke and anthracite	580	180	1.05-1.35
3. Cereals (decrease of humidity 5%)	"	180	40-45	1.0-1.15
4. Beet and other seeds . .	"	170	35-38	0.9-1.0
5. Beet slices	"	520	180	3.3-3.6

Numerous experiments have been made for the purpose of determining the best temperatures and speeds of the hot air in the case of different products; the results are given in the table.



The universal desiccator is provided with a regulator placed beneath the mechanism which revolves the drum allows of a variation in the

number of revolutions from 3 to 12 per minute, in order that the rate of the passage of the substance in the machine may be proportional to its moisture-content. This is effected by multiple pulleys. On leaving the drum, the dry material is cooled in a cooling compartment and after having passed through a sorting sieve, can at once be placed in sacks and stored.

Sorting the dried substances is indispensable in the case of the substances, to which soil adheres during growth and gathering, in order that no particles injurious to animals may be left in the dried fodder.

This universal desiccator is made in different sizes and for different purposes.

1075. — **New Pump for Farm Work.** — MONIN in *Vie à la Campagne*, Vol. I No. 163, p. 29. Paris, July 1, 1913

This pump is distinguished by its extreme simplicity, by the facility with which it can be set and by its perfectly uniform action.

It consists, as may be seen from the annexed figures, of a cylindrical body closed on two sides by plates, one of which bears the suction pipe and the other the forcing pipe. Within the body revolves another cylinder, in each of the faces of which a deep groove is cut at right angles to the one at the other end, and a block of metal like a water-tight piston slides in each of the grooves. These blocks are traversed and driven two diametrically opposed eccentrics fixed on the driving shaft, which occupies a slightly eccentric position towards the axis of the cylindrical body of the pump.

Fig. 1 is a section of the apparatus showing the arrangement of the working parts. Fig. 2 is a perspective view of the movable parts. Figs. 3 to 7 show the successive positions taken up by the several pistons during one complete revolution of the driving shaft. Fig. 8 shows the pump without the front plate and fig. 10 the body and the working parts separately.

1076 — Review of Patents.

Tillage implements and machines.

- 261 745 (Germany). Spring-bolt regulator for lateral displacement of double-furrow ploughs.
- 261 940 (Germany). Tractor for common ploughs.
- 60 719 (Austria). Motor plough.
- 1 067 111 (United States). Plough.
- 1 067 068 (United States). Plough attachment.
- 1 067 065 (United States). Harrow.
- 1 066 323 (United States). Plough and cultivator.
- 453 087 (France). Agricultural tractor.
- 455 362 (France). Regulator for ploughs.
- 6 361 (England). Tractor engines.
- 7 814 (England). Harrows.
- 131 522 (Italy). Improvements in mechanical ploughing tackle.
- 131 440 (Italy). New system for mechanical ploughing and cultivation.
- 131 836 (Italy). Arrangement for simultaneous ploughing and harrowing.

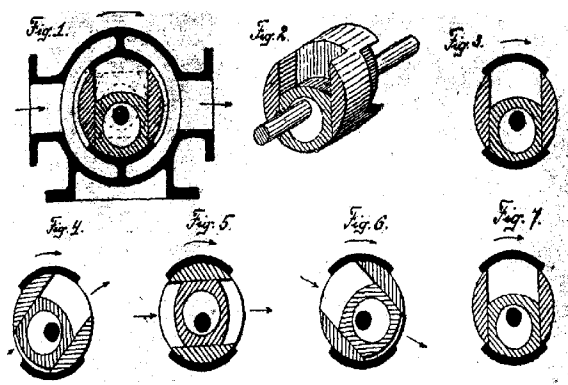


Fig. 8.

Fig. 9.

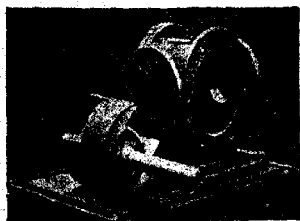
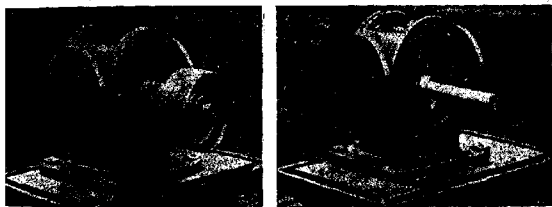


Fig. 10.

2 (Switzerland). Mechanical cultivation outfit worked by electric motor.

3 (Switzerland). Grass harrow.

Manure distributors.

66 (Germany). Manure distributor with distributing axle in the hopper.

43 (France). Manure distributor for vineyards.

16 (France). Portable manure distributor with fans.

Drills.

14 (Germany). Drill with agitating wheels and distributing surfaces in conjunction with

61 (France). Drill.

Reapers and mowers.

47 (Germany). Arrangement for converting a mower into a reaper.

48 (Germany). Rotary cone-shaped ear-separator for reapers.

4 (Austria). Reaper with discharging rake.

946 (United States). Mower attachment.

38 (France). Lawn mower improvements.

Machines for lifting root crops.

78 (Germany). Potato lifter, in which the potatoes are carried into a revolving sieve drum, which also acts as the driving wheel.

71 (France). Potato lifter.

Threshing machines.

95 (Germany). Short-straw sieve for threshers.

024 (United States). Thresher-Cylinder.

95 (Italy). Improvement of the beaters in threshing machines.

Other agricultural machines and implements.

50 (Germany). Milking machine, in which the caps consist of one fixed and one movable part.

1 (Austria). Knife-sharpening machine.

3 (Austria). Transplanting apparatus.

467 (United States). Hay-press.

26 (France). Cereal weed-sprayer, for use with sulphuric acid.

(England). Cow-milkers.

24 (Italy). Continuous-action drier with automatic delivery, for cereals and other materials.

5 (Switzerland). Drier for grass and cereals.

- **Alpine Cheese Shed.** - *Il Caseificio moderno*, Year 6, No. 14, pp. 216-217. Piacenza, July 15, 1913.

This building, designed for the Alps, is intended to arrange under roof, in a simple and economical manner, a room for treating the ; a room for ripening the cheeses, a shed for the cows and accommodation for the hands.

In the accompanying plate, the three upper figures show sections through EF, CO and GH of the plan (lowest fig.): the middle figure is aitudinal section along AB. The scale is 1: 100.

The cow-shed is 8 meters (26 ft. 2 in.) long and can hold 16 to 20 ; it is connected with the manure pit by a gutter. The cheese-room a north window and is sunk a few steps so as to keep it cooler and be same time to allow more space for the sleeping-room above; in t of it is a wide porch, which keeps off sun and rain.

The back part of the kitchen is boarded off at 6ft. 6in. from the floor to form another sleeping-room, to which a wooden step-ladder gives access; there is a door between this and the central sleeping-room. The roof is very simple. The total cost of the building is about £ 196.

RURAL ECONOMICS.

1078 - **The Problem of Encouraging a Fresh Development of the Agricultural Production of Germany.** - 1. VON LOCHOW. Landwirtschaftliche Produktionssteigerung auf der bisherigen Fläche. - 2. BESELER. Landwirtschaftliche Produktionssteigerung durch Vermehrung der Kulturfäche. - 3. SERING. Landwirtschaftliche Produktionssteigerung durch innere Kolonisation. - *Archiv des Deutschen Landwirtschaftsrats*, Year 37 (Report of the Proceedings of the 41st General Assembly of the German Agricultural Council, Feb. 11-13, 1913) pp. 53-77. Berlin, 1913.

1. From 1885 to 1889 the mean production of cereals in Germany was 1195 lbs. per acre, while from 1905 to 1909 it was 1624 lbs.; the increase in twenty years has thus been 36 per cent. During the same period the yield of potatoes rose from 9010 lbs. to 12400 lbs. per acre. Von Lochow refers to the data of his own farm to show that this production could be considerably increased by suitable systematic selection, based on yield, and this apart from any increase due to heavier manuring or better cultivation. He shows how this method has been applied to rye and quotes the results obtained with both rye and oats.

If Germany's rye crop were increased by 10 per cent., the increase in the agricultural production involved would be worth nearly £ 400,000. Similar results could be obtained with wheat, barley, potatoes, sugar-beet and in particular green crops.

The production of live stock would also be considerably increased by the adoption of selection based on productivity. The writer illustrates this point by reference to figures from the Milk Control Societies compared with those from uncontrolled cows; it appears that an average increase of 50s per head of dairy cattle can readily be obtained, giving £ 27,000,000 for 11 million animals. The poultry industry, too, might give far larger yields by the adoption of proper selection. But to get small farmers to particular to take up this question more than they have done so far requires educational work: this could best be accomplished by arranging peripatetic lectureships.

2. Beseler deals with the increasing of the German production by extending the area under cultivation. According to Fleischer's calculations there are 8.7 million acres of waste moorland in Germany which might be brought under cultivation and yield three-quarters of a million tons of meat a year, without reckoning other produce; this area could support 70,000 families on holdings of varying extent. Taking the cost of meat at £ 40, the extra production obtained would be worth something like 30 millions sterling. The writer dwells briefly on the progress realised in the cultivation of moors and sandy heaths, and estimates that the

tal required to bring such land in Germany under cultivation is about millions; this would be well spent, as it would give an increase of total production of the country, and further would contribute to the development of certain industries, in particular to that of chemical manures, as these would be required for the extra cultivated area.

3. Home colonisation aims at the most intensive utilization possible of available land. Its economic task is to increase the bulk of the agricultural production. Dr. Sering shows that home colonisation fulfils this aim not only as regards the products of live stock — in peasant colonies of 12 to 50 acres there are 30 head of large stock per 100 acres compared with only 14 on large holdings of over 250 acres — but also for field produce. Dr. Keup and Richard Mührer have determined the average increase of production due to home colonisation in East Prussia with as much accuracy as possible (1). Their results show that the stock of horned cattle has doubled or even tripled in a few years, the number of pigs has tripled or quadrupled. The farms are now fairly distributed over the whole area, allowing all parts to be intensively cultivated: the difference between fields round the steading and distant ones has disappeared, and the rotation is thoroughly adapted to soil conditions. Labour is both more abundant and better suited to requirements than previously, for at the busy seasons of seed-time all the members of the family can help. As the amount of land available in the new colonies is two-and-a-half or three times as much as before, and the use of chemical manures has not fallen off, it is natural that the production has increased considerably. The division of the land among the peasants has led to an extension of cereal growing; as a result of this, in the Pomeranian colonies the production of grain has doubled in ten years, while in those in Neumark it has been increased by half as large again. In spite of the increased home consumption, the amount of produce sent away from the colonies is greater by 40 to 50 per cent. than that from the original farms. The writer estimates that the area capable of division into small peasant holdings in East Prussia (excluding the province of Posen) at 6 100 000 acres. But large properties and owners possess the intelligence, knowledge and energy required to take advantage of the results of technical and scientific progress to them, should be regarded as agricultural models for the small holders.

The Agricultural Conditions of the Province of East Prussia. — HANSEN, *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 21, pp. 241-249. Hanover, 1913.

According to the 1907 statistics of professions, out of the 2 003 339 inhabitants of East Prussia, 1 028 608, or 51.3 per cent., were engaged in agriculture; for the whole Kingdom of Prussia the average agricultural

BRICH KEUP and RICHARD MÜHRER. *Die volkswirtschaftliche Bedeutung von Gross- und Kleinbetrieben in der Landwirtschaft*. Berlin: Parey, 1913.

(Author's note).

population is only 27.4 per cent., while in the Province of Saxony 25.7 per cent. and in the Rhenish Province as low as 16.9 per cent.

East Prussia, forming a part of the lowland plain of North Germany, is largely low-lying, and it is only here and there, particularly in the south of the Province, that ranges of hills reaching 1000 ft. or more. In general light sandy soils prevail in the south, while more or less heavy loams characterize the lower ground in the north.

The climate is severe; the mean temperature from December to March is below 0°C. (32° F.). Except for a narrow littoral belt, the Province has a markedly continental climate, with great contrast between the heat in summer and the cold in winter, which is often very severe. The summer maximum is over 30° C. (86° F.) and the winter minimum below -20° C. (-4° F.). Owing to the short vegetative period, sowing work on the land has to begin very late, while in autumn work is stopped early.

The means of communication and transport, which were formerly very difficult, have been much improved recently by the opening of the State and secondary railway lines, which have greatly facilitated the disposal of agricultural produce. In this way East Prussia has been brought into much closer contact with the western markets, as is seen from the equalization of prices between Eastern and Western Germany. In the decade 1861-70 the price of a ton of wheat in Rhenish Prussia was 27s 6d higher than in East Prussia, while for rye it was 34s higher; in 1901-05 these differences were respectively 8s 8d and 10s. Between 1861-70 and 1900-05 the price of beef rose 29 per cent. in Rhenish Prussia and 72 per cent. in East Prussia.

The total area is 9 150 000 acres; the number of farms is 219 200. The 1907 statistics give the following data on the distribution of land among the holdings of different sizes:

Classification according to size	Percentage of number of farms					Percentage of area farmed		
	East Prussia	Province of Saxony	Rhenish Prussia	Kingdom of Prussia		East Prussia	Province of Saxony	Rhenish Prussia
Under 5 acres	52.2	69.5	70.9	61.8		2.2	6.5	11.9
5-12½ acres	14.9	10.9	15.4	15.3		4.3	6.7	20.0
12½-50 acres	20.1	14.3	12.3	17.1		17.6	26.7	41.6
50-250 acres	11.3	4.8	1.3	5.2		38.8	34.1	20.3
Over 250 acres	1.5	0.5	0.1	0.6		37.1	26.0	32.2
Over 500 acres	—	—	—	—		28.2	19.5	0.5

Thus over a quarter of the area under cultivation consists of properties of over 500 acres, while farms of under 50 acres (the first three es) do not make quite a quarter. The efforts towards changing this portion in favour of the smaller holdings by means of home colonization centred in the East Prussian Rural Association (Ostpreussische Landschenschaft); this body, up to the end of 1912, had started 1221 new independent farms of various sizes, but all less than 125 acres. The farmers of East Prussia rent only 5.9 per cent. of their land, compared with 13.3 per cent. for the whole kingdom and 20.5 per cent. for the Province of Saxony. Out of every 100 strictly agricultural farms in East Prussia, 87 are owned by their occupiers and 8 others half owned.

The 1900 statistics show the following utilization of the land:

	Province of East Prussia	Kingdom of Prussia
	per cent	per cent
Arable and garden land	55.3	50.7
Meadow	11.2	9.4
Pasture	6.9	5.9
Forest and copse	17.4	23.7
Space occupied by houses and yards, wastes, roads, streams, etc.	9.2	10.3

The arable and garden land is divided as follows:

	Province of East Prussia	Kingdom of Prussia
	per cent	per cent
Cereal and pulse crops	57.2	61.6
Hoed crops	10.2	17.6
Industrial crops	0.4	0.6
Green crops	12.9	9.5
Temporary grassland	7.6	5.1
Fallow	10.8	4.2
Gardens and fruit plantations	0.9	1.4

The reason for the smallness of the area devoted to hoed crops the size of that under fallow is to be sought in climatic conditions; intensive cultivation of green crops and the high proportion of permanent grassland show that live stock is of great importance in East Prussia.

In the last few years a great number of permanent improvements have been made; drainage has made great progress, and much activity is displayed in the reclamation of marshes and the laying down of permanent pastures. The use of chemical manures is increasing rapidly, both on arable land and on permanent grassland.

The rotations at present followed in East Prussia are based on improved extensive culture rotation of arable land and leys (gerg Feldgrasswirtschaft); they may be called modified four-course rotation.

Climatic and economic conditions combine to make East Prussia specially suitable for live-stock raising. The live-stock census for 1873 and 1911 are as follows:

	Province of East Prussia			Kingdom of Prussia		
	1873	1911	Difference	1873	1911	%
			per cent.			
Horses	350 478	489 655	+ 40	2 282 435	3 171 570	+ 39
Cattle	785 646	1 204 889	+ 53	8 639 514	11 682 230	+ 34
Sheep	1 841 437	379 879	- 79	19 666 794	4 372 480	- 78
Pigs	463 718	1 489 292	+ 221	4 294 926	17 244 820	+ 303

The breeding of horses in East Prussia is famous throughout world. Almost all the breeding of pedigree half-bloods is carried by the peasant-proprietors, who use the mares for field work and them to State stallions. The foals are sold to larger proprietors have at their disposal the wide extents of pasture necessary for rearing them. For some time the breeding of heavy horses has also been undertaken in East Prussia; the stock was built up from Belgians in the Rhine Province.

Cattle have developed enormously: East Prussia now forms a centre of intensive breeding of the Black-and-white Lowland breed; this was further encouraged by strong Herdbook Societies, Control Societies and Breeders' Associations.

All the measures tending to the encouragement of agriculture are either from the Chamber of Agriculture for the Province of East Prussia or from the three Central Agricultural Societies; the latter, 350 affiliated societies, number some 20 000 members.

Agricultural education is imparted by the Agricultural Institute of the Royal University of Königsberg, by two Agricultural Colleges, 19 winter agricultural schools, two institutes for dairy instruction, one school each for domestic economy, meadow cultivation and horticulture. The directors of the winter schools also act as permanent instructors in agriculture, as do five live stock instructors, one pig inspector, one dairy instructor and three fruit inspectors.

Land credit is undertaken by the "Ostpreussische Landbank"; credit for agricultural improvements is provided by the auxiliary Provincial Pay-Office. There are three great Cooperative Unions; the

there are numerous cooperative dairies, and associations for sale purchase, producers' associations, etc. The Cooperative Book-keeping of Königsberg occupies a place by itself; it was founded in at Insterburg, and now closes the books of about 150 farms.

Difference in the Returns of two Dairy Farms and its Causes. — RÖSTENDORFER, KURT. Zur Frage der Rentabilität der Abmelkwirtschaft. — *Illustrierte landwirtschaftliche Zeitsung*, Year 33, No. 56, pp. 516-518, Berlin, July 12, 1913. The writer calculates the utilization value of the unmarketable food med by the milch cows on two dairy farms in which no breeding is d on, and from this draws inferences as to their returns.

Farm A is close to a large town on the Rhine. Its area is 445 acres; there were 68 acres under sugar-beets and 25 acres under mangels. is no permanent grassland. Consequently there is a plentiful supply of and ensilaged beet slices and leaves, but little hay. The feeding is cessive.

Table I shows the purchase and sale price of the cows, their depreciation and the length of time they were kept.

TABLE I.

Year	Purchase price	Sale price	Depreciation per cow	Three-year averages of depreciation	Length of time kept
	£ s	£ s	£ s	£ s	
.....	28 5	24 4	4 1	—	10.8
.....	25 5	21 10	3 15	4 1	11.2
.....	24 2	20 8	3 14		11.8
.....	24 1	19 7	4 14		10.5
.....	26 7	21 4	5 13		11.1
.....	27 2	23 9	3 13	4 13	11.9

The average sale price reckoned has been increased by the amount of loss by death and diminished by the amount received by sale of calves. The average milk-yield per cow in 1911 was 1104 gallons. The average price made by the milk was 1s per gallon (1s 1d for milk in bottles, 1s and 9 1/2 d and 9 d for large orders). The cows are mostly bought in England, rarely just after calving. Purchase and sale are carried out through the dealer. The cows are not put to the bull. In 1911 the average herd was 1 (mostly black-and-white East Friesians). The cows are attended by one man and a woman. The distribution of the milk is done by six

The expenses for 1911 were as follows :

	£	s	d
Attendance	389	2	3
Rent of stable (£1225 at 6%)			
Utensils (£150 at 6%)	97	10	0
Lighting (petroleum) £. 15			
Fire insurance	1	7	6
Interest on capital in cows (£2385 at 4 %)	95	8	0
Interest on working capital (£6 2s 6d per cow, at 4 %)	21	11	3
Veterinary attendance and medicine	24	10	0
Depreciation of cows	321	15	3
Administration expenses (accounts, offices and manager)	101	14	6
Sale expenses	937	5	0
Expenses of collecting debts	11	15	6
	£2001	19	0
Concentrated foods	1507	15	0
	£3509	14	0

Against this there is the sum of £ 4874 13s 9d by sale of milk.

The calculation of the value of the food consumed was made according to Brinkmann's formula :

$$F = \frac{V - (G - g) P}{g}$$

F is the feeding-value of 1 kg. (2.2 lbs.) of starch value in home-grown produce to be used as the basis of the ration; V is utilization value of the food; G is the total content of the ration in starch values, g the content of the basal food in starch values; P is the average price of 1 kg. of starch value over all the concentrated food; $(G - g) P$ is therefore the purchase price of all the concentrated food, i.e. £1507 15s; V is the revenue from the sale of milk less the cost of production (leaving out the concentrated foods), i.e. £4874 13s 9d - £2001 19s. The total content of the basal food in starch values is £4672 12s. We thus

$$F = \frac{£4874\ 13s\ 9d - £2001\ 19s - £1507\ 15s}{4672.6} = 0.2921s, \text{ or about } 3\frac{1}{4}d$$

The basal food for 1911 should therefore be valued as follows:

	£	s	d
Total basal food	1365	3	
Hay (2 tons 7 cwt.) per ton.	4	10	
Oat straw (43 tons 16 cwt.)	2	9	
Chaff, half wheat, half oats (29 tons 4 cwt.)	3	17	
Mangels (285 tons 14 cwt.)	18		
Wet beet-slices (181 tons 11 cwt.)	14		
Beet-slice silage (80 tons 3 cwt.)	19		
Beet and mangal leaf silage, half-and-half (468 tons 13 cwt.)	1	11	
Green rye (2 tons 2 $\frac{1}{4}$ cwt.)	1	12	
Green maize (50 tons 2 cwt.)	1	6	

The utilization value is thus highly satisfactory. Farm B has an area of 315 acres and is 17 ½ miles from the same town; milk is sent three-quarters of a mile by road and the rest by rail to a seller. The cows, mostly East Friesians, are bought from a dealer, rally lately calved and rarely in full milk. The average number in herd is 54. Table II shows the average purchase and sale prices, and depreciation per cow.

TABLE II.

Year	Purchase price	Sale price	Depreciation per cow	Three-year averages of depreciation
	£ s	£ s	£ s	£ s
1899	20 2	15 19	4 3	3 16
1900	20 1	16 13	3 4	
1904	21 15	18 7	3 4	
1905	22 16	17 7	5 10	4 4
1906	23 2	19 8	3 14	
1907	26 1	19 11	6 10	
1908	26 1	19 13	6 8	6 12
1909	25 7	18 9	6 18	
1910	25 18	17 14	8 4	
1911	27 5	19 15	7 11	7 1
1912	27 7	22 0	5 7	

The cows are not put to the bull. The average milk yield per cow in last year was 1122 gallons. The feeding is rather heavy, as each cow gets it 16 lbs. of concentrated food per day, summer and winter. The animals are looked after by a cowman and his son and two daughters. The valuation of the food consumed by the cows on farm B is shown in Table III.

TABLE III.

Year	Receipts from sale of milk		Receipts from sale of fat cattle		Value of milk consumed in the house (1.1 gallon per day)		Total receipts		Labour		Cost of milch cows		Concentrated food	
	£	s	£	s	£	s	£	s	£	s	£	s	£	s
1898-99	1 071	11	877	7	10 15		1 959	12	150	9	1 226	1	664	15
1899-00	1 092	13	816	2	11 12		1 920	7	150	9	862	8	686	17
1903-04	1 297	16	1 028	11	11 12		2 337	19	150	9	1 436	14	654	18
1904-05	1 391	1	1 005	0	12 11		2 408	12	168	6	1 117	11	765	18
1905-06	1 620	15	1 337	19	12 11		2 971	5	168	6	1 617	5	960	7
1906-07	1 730	4	1 173	12	12 11		2 916	7	183	2	1 613	11	1 026	9
1907-08	1 805	7	902	17	13 9		2 721	13	189	13	1 300	19	1 007	8
1908-09	1 942	7	905	2	13 9		2 860	17	189	13	1 318	17	1 218	10
1909-10	2 026	10	1 169	8	13 9		3 209	7	189	13	1 658	16	1 134	11
1910-11	2 062	3	1 149	18	13 9		3 225	9	183	15	1 526	19	1 318	3
1911-12	1 954	2	1 363	11	14 15		3 332	9	183	15	1 723	15	1 302	11

(1) As the figures for the fixed items are rounded up, the sums of the items do not exactly agree.

These figures show that the utilization value of the home-grown food (clover, beet leaves and chaff) is small. In five of the years, fairly even distributed over the period under consideration, this value is a negative quantity, or in other words the full interest on the live and dead stock is not paid. This shows that if certain conditions are not fulfilled, the returns from this type of dairy farming may be small, in spite of large receipts from the sale of milk.

The great difference in the returns from the two farms is attributed by the writer to the following circumstances: The favourable return from farm A is due to the small amount of the depreciation per cow, the judicious use of concentrated foods, the moderate intensity of feeding and the gain from retailing the milk. As the total expenses of retailing were 2.57 pence per gallon and the difference between the retail and wholesale prices was

TABLE III.

Lighting (electric from 1908)	Administration: £ 15 vet and medicine: £ 6		Interest on capital in cows		Interest on working capital		Interest, amortization and upkeep of horse and cart		Carriage of milk		Total expenses (1)		Value of foods		Three-year averages of value of foods	
£	£	s	£	s	£	s	£	s	£	s	£	s	£	s	£	s
3	21		42	1 10	12	17	18	26	17	2 189	11	—	229	19	74	11
3	21		38	11 10	12	17	18	26	17	1 839	10		80	16		
3	21		49	6 10	12	17	18	26	17	2 397	8	—	59	9		
3	21		42	9 10	12	17	18	26	17	2 200	4		208	8	69	13
3	21		59	2 10	12	17	18	26	17	2 911	5		60	0		
3	21		55	15 13	5	17	18	26	17	2 987	16	—	71	9		
3	21		44.	2 13	5	17	18	26	17	2 650	19		70	14	7	11
5	21		44	10 13	5	17	18	26	17	2 882	15	—	21	17		
5	21		56	11 13	5	17	18	26	17	3 151	4		58	3		
5	21		53	9 13	5	17	18	26	17	3 193	18		31	11	12	18
5	21		61	15 13	5	17	18	26	17	3 383	9	—	51	0		

is column, exceeding them by about 23 s.

(Ed.).

the gain on retailing is 0.65 of a penny; on a yield of 1104 gallons this is a yearly gain per cow of £3. The unfavourable results of farm B are attributable to the large depreciation per cow and the heavy bill for concentrated foods. The small amount of home-grown food should be noticed in connection; ensilaged beet-leaves were first used in 1909-10 and only in small quantities, while mangels are quite lacking. This increase in cost of food brings only a slight saving in labour. It is seen that along with the price made by the milk the personal factor of the farmer is a primary determining factor in the profitability of the concern; the more he possesses the qualities necessary for the head of a farm, namely sound judgment for the animals he purchases, ability in feeding and the capability of fixing on technically sound rations, the more will be the results of his dairy farming.

1081 - **Collective Renting of Farms.** — RAMBAUD in *Annales de l'Ecole Nationale d'Agriculture de Grignon*, Vol. 3, pp. 107-135. Paris, 1912.

Collective renting has been practised in Italy for some twelve years. The chief object of the system is to do without the middleman (gabai lotto), to whom small tenants had formerly to apply, by taking on lease of farms and land direct by means of a cooperative renting association; a further idea is to obtain at any rate a partial remedy for the unemployment occurring at certain seasons, by bringing waste land under cultivation and introducing intensive methods.

In Upper Italy there are at present 22 of these renting associations cultivating, 17 400 acres; in Sicily there are 43, with 62 962 acres. The land rented may be farmed either collectively or separately by the members of the cooperative association.

In 1907 there were 106 such associations in Rumania, with 140 members cultivating 188 000 acres and paying an annual rent of £2300. In 1909 the number had increased to 300, with 445 000 acres rented for nearly £200 000. The land is divided among the members in holding not exceeding 25 acres, and varying according to the working capacity of the member's family.

Collective renting is also practised in Bohemia (among the Czechs), Hungary and Servia. The writer discusses the results obtained in Italy and expresses the hope that this system may be introduced into France.

1082 - **Efforts towards the Economic and Social Improvement of the Conditions of the Agricultural Labourers.** — VON BATOCKI in *Archiv des Deutschen Landwirtschaftsrats*, Year 37 (Report of the Proceedings of the 41st General Assembly of the German Agricultural Council), Feb. 11-14, 1913, pp. 137-146. Berlin, 1913.

The writer believes that the best means towards reducing rural population and creating and maintaining a fixed class of agricultural labourers is to improve economic and social conditions in the country. This would involve: extension of the area cultivated by labourers, as far as this is possible; making stock keeping possible (milk cows and breeding of small stock); utilization of animal products by cooperative means; wage in kind; arranging of winter work (forestry work and home industries); technical instruction; adoption of profit sharing; better instruction of women in domestic economy; regularization of the relations between employer and his men.

AGRICULTURAL INDUSTRIES.

1083 - **The Calorific Value of Milk in relation to its Price and its Nutritive Value.** — ASCERRI, G. in *L'industria lattiera e casearia*, Year XI, No. 12, pp. 1854-1859. Reggio-Emilia, June 15, 1913.

The idea that a knowledge of the butter-content of milk is sufficient indication of its value, and often also of its purity, is the foundation of the commercial valuation of this article and is also relied upon in most municipal regulations for the control of milk. The adoption of this criterium

of differences of opinion and scientific and legal criticisms in prosecutions made by the public authorities against dairies; and this result is natural, as it is only in such cases as butter factories, in which the only ingredient required, that the method is sound. With milk for cheese-factories, or as human food, it is not feasible to leave out of account the other constituents, especially the casein and the lactose. Experience has shown that the milks richest in fat do not necessarily give large high-class products; and it often happens that a lack in fat is made up by abundance of protein.

All these considerations serve to explain why search has been made for other methods, as simple and exact as possible, for valuing and comparing milks for industrial use and for food. Dr. F. I. Herz, Government factor of cheese-factories at Munich, describes one of these methods in pamphlets ("Milch, Butter, Käse" and "Die Milch und ihre Erzeugung für die Volksernährung", Berlin, 1913); it consists in the determination of the calorific energy in 100 grams of the milk. This energy is held to be proportional to the nutritive value of the milk, which should be taken as the basis of its trade value.

Dr. Herz gives tables for the determination of the calorific energy from the specific gravity and the fat content. He arrives at this by calculating the solids not fat, using Vieth's relationship between the constituents, and taking the number of calories developed by one gram of protein, or fat.

When the fat and specific gravity of a milk have been determined, the solids not fat may be ascertained by using the following formula:

$$S. N. F. = \frac{g + 1}{4} + \frac{f}{5}$$

in which g = the excess of the specific gravity over 1 multiplied by 1000, f = the percentage of fat. Thus, a milk with S. G. 1.0315 and fat 3.6 per cent., would have solids not fat:

$$S. N. F. = \frac{31.5 + 1}{4} + \frac{3.6}{5} = 8.84$$

Applying Vieth's relationship, that is the proportion sugar : protein : fat = 13 : 9 : 2, the percentages of sugar and protein would be respectively 36.1 and 3.31. To get the calorific value (Wärmewert) these figures must be multiplied by the number of calories that one gram of each of the substances will produce on combustion, namely 4.1 for proteins and sugars and 9 for fats.

All these calculations have been reduced to one simple formula:

$$S. N. F. = g - 1 + 10f.$$

For a milk of S. G. 1.032, containing 3.6 per cent. of fat, we have:

$$S. N. F. = 32 - 1 + 36 = 67$$

According to Dr. Herz, milks with normal proportions of fat, protein and lactose have a calorific value of between 65 and 70. The writer considers the method very ingenious and also trustworthy, seeing it is based on positive experimental data regarding all the useful components of the milk.

The use of this figure for judging the purity and goodness of milk involves no addition to the work of analysis, as the specific gravity and content are always determined in milk control; it has the advantage of referring the whole to a single figure, which varies within very narrow limits for it is well known that though one constituent of milk may show considerable deviations from the normal, these are generally balanced by the other constituents. When these figures are fixed for any given milk-producing district, the characters will be readily recognized and can form the basis for municipal regulations for fixing the type of milk in the district.

The figures may also be used for selecting the best milch cows, as well as for the selection of milks for rearing infants by hand.

1084 - *Micrococcus mucofaciens*, New Bacterium of Ropy, Slimy Milk. — THÖNI, J. in *Schweizerisches Zentralblatt für Milchwirtschaft*, Year II, No. 39, p. 399, Brugg, July 17, 1913.

This new bacterium which has been isolated from commercial milk by the writer, if cultivated in pure cultures on gelatine, causes a sterile milk to become ropy at normal temperatures after 18 to 42 hours; it alters it to such an extent that under an upper thick layer of cream a yellow brownish slimy layer is formed; this is thin at first but gradually grows thicker; under these two layers there is one of creamless milk apparently sound. At 35° C. the milk becomes slimy after 14 hours. In order to destroy this micro-organism it is sufficient to heat the milk to 70° C. for five minutes; treating the milk with 1 per cent of milk of lime for half an hour has the same effect.

1085 - The Classification of Lactic Acid Bacteria. — GORINI, COSTANTINO in *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 37, No. 21, pp. 452-460. Jena, May 1913.

The writer criticizes the principles according to which the lactic acid bacteria have been hitherto classified and he expresses the opinion that this classification should be based especially on the physiological characters and not exclusively upon the morphological ones.

The principal points to which he has for many years successfully devoted his attention are the following: Behaviour of bacteria at different temperatures, rapidity of coagulation, duration of the vital period, producing, caseolytic and acidifying power, and characters of the products of caseolysis.

1086 - Preparation and Use of Yoghurt. — WIEGERT, ELISABETH in *Molkerei-Zeitung*, Year 23, No. 28, pp. 326-328. Berlin, July 12, 1913.

The writer describes the virtues of Yoghurt (curative properties in diseases of the liver and kidneys, disinfectant power and favourable action on animal metabolism).

She next states as the result of numerous experiments, that the preparation known in trade under the name of 'Yoghurt-Maya-Ferment' and most of the dry preparations are not satisfactory for making yoghurt, and lastly she describes a process both simple and economical for preparing Yoghurt in the household.

Factors influencing the Change in Flavour in Storage Butter.—ROGERS, L. A., BERG, W. N., POLTEIGER, C. R., and DAVIS, R. T.—*U. S. Dept. of Agriculture, Bureau of Animal Industry, Bulletin No. 162*, pp. 69. Washington, April 1913. The influence which organisms exert on the odour of milk, cheese and other products of the dairy suggests a similar explanation of the changes which take place in stored butter.

Jensen has shown that under certain conditions bacteria do multiply in butter and have a direct influence on the flavour of the product. The writers have found no evidence of bacterial growth under normal conditions in their samples of butter, but have noticed a small multiplication of torula at high temperatures. In these cases there was no apparent relation between the growth of torula and the change in flavour. Moreover the changes took place in duplicate lots of butter at temperatures so far below the freezing point that there could be no possibility of growth. The writers point out that the salt content of American butter is equivalent to an aqueous solution of 18 % or more, a concentration sufficient to prevent at least retard bacterial growth, whilst that of European butter is considerably less. This led them to suggest the possible influence of lipolytic enzymes, but it was found that butter may show a marked change in flavour without any appreciable hydrolysis of the fat. There remained the possibility of proteolytic enzymes and of chemical changes of an oxidative nature. The presence of water bacteria and the proteolytic enzyme of which known as galactase would favour proteolytic changes in butter. Other investigators had already shown that under comparatively high temperatures and low salt concentration the butter proteins undergo changes.

The present work is concerned with investigation into the influence of low temperatures and high salt concentrations on the activity of galactase in butter made from pasteurised and unpasteurised cream. The writers found that the ordinary method of determining the extent of proteolysis were not sufficiently delicate and were influenced by such factors as the content on the precipitability of casein.

They therefore devised a method of removing considerable portions of fat and casein by a system of decantation previous to applying the chemical methods of estimating the hydrolysed proteins. They found this method much more delicate in its results and showed that proteolysis did not take place to any appreciable extent in either pasteurised or unpasteurised butter, nor was there any relation between the figures for nitrogen and the nitrogen scores.

Only in the presence of very large amounts of strongly active proteolytic enzymes, did they find hydrolysis to occur under conditions of cold storage and high salt content, and there is no reason to suppose that such amounts of enzymes are ever found in butter.

The possibility of the action of enzymes liberated by the death of bacteria was then investigated.

They found that whilst there was a marked difference in the rate of deterioration in the raw cream butter and the pasteurized cream butter, reinoculation of the cream with bacteria had little or no effect on the keeping quality of the butter.

The investigations on the oxidation effect of included air were not conclusive. The authors found no alteration in the carbon dioxide content of the enclosed air, but a decided decrease in the oxygen content, as if part of this gas had been removed. It still remains to be proved that the oxygen was actually removed by some butter constituent. The results show that butter contains about 10 % by volume of gases.

The effect of metals on butter.

The influence of iron was first investigated and it was found in general that a relatively small part of the iron present in cream goes into the butter as compared with the butter milk, which seems to take most of the iron, and in which the presence of a flavour due to the iron was most noticeable. Various quantities of iron as ferrous sulphate were added to pasteurised cream and the resulting butter was scored for flavour at different periods. It was found that the butters with the added iron showed much quicker deterioration than the control butters. Below a certain point of deterioration differences were not recognisable. The control butters were the last to develop a "fishy" flavour and a most noticeable feature was the development of a very oily flavour as a stepping stone to the "fishy".

Similar experiments were conducted using copper sulphate and similar results were obtained as in the case of the iron salt.

The deteriorating effect of copper was very pronounced in the case of butter made from cream pasteurised in a copper vessel, the tin coating of which had been worn away. The contact was only for a few seconds, a very decided fishy flavour developed in 30 days, whereas control butter from a tin-lined pasteuriser remained quite good. Copper would appear to be more powerful in its effects than iron.

The difference in the absorption of iron by cream in contact with rusty and clean metal appeared to be insignificant, provided the butter was made under similar conditions. The precise nature of the action of the metals on the cream and butter is not definitely known, but it is supposed that it is of the nature of a catalytic agent in an oxidising process. Experiments lead the writers to believe that the lactose may be oxidised by a metallic peroxide in the presence of iron, but further work is necessary before definite conclusions can be drawn.

It was found that no change took place in the lactose content of cream when iron was added to milk containing 18 % sodium chloride even though a current of oxygen was passed through for 72 hours.

Iron salts (particularly ferrous) produce very strong odours when added to milk as the distillate from such milk gave very pronounced iodine tests. Whether the small amounts of iron ordinarily present in but-

89% can slowly bring about the same kind of change that larger amounts can bring about in milk in a very much shorter time is to be determined by future investigation.

8 - **The Manufacture of Cheese from "Heated" Milk** (1). — BENSON, M. and EVANS, R. H. in *The Journal of the Board of Agriculture*, Vol. XX, No. 4, pp. 281-301. London, July 1913.

In 1905 a number of cheddar cheeses were made at the British Dairy Institute, Reading, with milk heated to temperatures of from 150° F. to 160° F. The heating took place in a steam jacketed cheese vat, and an ordinary Lawrence cooler was used for the subsequent cooling. On the whole, the cheeses made from the milk heated to below 165° F. were a success, while those made from milk heated above that temperature were not, being rather too moist, and faulty in texture. In 1909-10 a further series of experiments was carried out. In this case the heating was done out of contact with the air in a jacketed cylindrical copper vessel with a tightly fitting lid, and a current of carbon dioxide gas was passed through the milk. The heating was effected by running cold water through the jacket. A temperature of 210° F. was adopted and great difficulty was experienced in making the cheeses: the coagulation was bad, the curd would not part from its whey, and seemed to have lost its adhesive properties. As a result the cheeses were moist, granular in texture, with a tendency to flake apart and crack, slightly bitter, and inclined to develop a blue mould; in other words, though intended for cheddar cheese, they resembled more closely the Wensleydale variety.

In 1912 special apparatus was installed for heating and cooling the milk entirely out of contact with the air. It consisted essentially of a pasteuriser and of a Lawrence cooler covered in with movable top and side plates, and included also a so-called "retainer" or large drum in which the hot milk might be stored or "retained" if required. During the months of June to August 10 trials were carried out. On each occasion 600 lbs. of milk were employed and divided into 3 equal portions; one of these was untreated and acted as control, another was subjected to rapid pasteurisation and cooling, and the third was also pasteurised and cooled, but in addition a stream of carbon dioxide was passed through the pasteuriser at the rate of about 1½ lb. to 200 lbs. of milk. The temperature of pasteurisation varied from 160° F. to 200° F. in the different trials. Subsequently to treatment, each lot of milk was made into cheddar cheese and all the details of the manufacture are given in a table from which the following figures have been extracted:

In general it may be said that pasteurised milk required less starter than raw milk except when heated above 190° F. but about twice as much heat for coagulation. As in previous trials the curd was always softer and had a tendency to retain the whey, also it lacked coherence and required more pressure during the pressing stage as well as very secure bandaging.

(1) See No. 867, B. July 1913.

(Ed.).

Date of manufacture	Number of cheese	Milk heated to		Quantity of rennet used	Acidity in whey from press	Total solids in whey from vat	Max. pressure	Weight of cheese when matured		
								3 months	7 months	Points awarded
11		Deg. F.		Drams	% lactic acid	%	ewt.	lbs.	lbs.	
1912										
June 6.	1	84°	—	6 1/8	1.15	5.88	10	19	17 1/2	8
" 6.	2	160°	—	13	0.94	6.23	15	19	17	9
" 6.	3	160°	CO ₂	13	0.935	5.90	15	18 1/2	17	9
" 13.	4	86°	—	6 1/8	1.08	6.97	10	19	16 1/2	6
" 13.	5	165°	—	14	1.15	8.07	15	18 3/4	17	9
" 13.	6	165°	CO ₂	14	0.915	7.05	15	19	17 1/2	9
" 20.	7	84°	—	6 1/8	1.14	5.55	10	19	17 1/2	7
" 20.	8	170°	—	14	1.10	6.83	20	19	17 1/2	14
" 20.	9	170°	CO ₂	14	1.08	5.96	20	19 3/4	17 1/2	14
" 27.	10	85°	—	6 1/8	1.15	7.71	10	19 3/4	18 1/2	7
" 27.	11	175°	—	14	0.95	7.08	20	21	18	
" 27.	12	175°	CO ₂	14	0.98	6.77	20	21	18	
July 11	13	84°	—	6 1/8	1.03	7.1	10	18 1/2	17 1/2	7
" 11	14	130°	—	14	1.00	6.97	20	19 1/2	18	
" 11	15	180°	CO ₂	14	0.88	6.67	20	19 1/2	18	
" 12	16	84°	—	6 1/8	0.95	7.08	10	18	17	
" 12	17	185°	—	14	1.11	7.05	20	18 3/4	17 1/2	
" 12	18	185°	CO ₂	14	0.89	6.85	20	19 1/4	17 1/2	
" 18	19	84°	—	6 1/8	1.15	6.84	10	18 3/4	18	
" 18	20	185°	—	14	0.91	7.27	20	20 3/4	20	
" 18	21	185°	CO ₂	14	0.72	6.70	20	21 1/2	20 1/2	
" 25	22	85°	—	6 1/8	1.19	9.40	10	19	19	
" 25	23	190°	—	14	1.17	6.70	25	20 3/4	19	
" 25	24	190°	CO ₂	14	0.935	6.80	25	20 3/4	19 1/2	
August 1	25	84°	—	6 1/8	1.02	8.01	10	20	19	
" 1	26	195°	—	14	0.81	6.85	25	21 3/4	20 1/2	
" 1	27	195°	CO ₂	14	0.60	7.00	25	22	20 1/2	
" 2	28	85°	—	6 1/8	0.99	7.14	10	20 3/4	19 1/2	
" 2	29	200°	—	14	0.80	6.97	25	22 1/4	22	
" 2	30	200°	CO ₂	14	0.80	6.20	25	23	22	

(1) The poor results obtained in these 2 cases were due to faulty manufacture.

the whey from the treated milk presented the desirable green colour and contained a lower percentage of total solids than that from the untreated owing to the precipitation of the albumen in the curd; this was specially noticeable when high temperatures were employed. To ensure equality the pasteurised cheeses invariably required less salt than the unpasteurised ones, and the former matured more slowly and exhibited remarkable ripening qualities; they also gave more even results and were less liable to rancidity. Owing to the retention of the albumen by the curd, the treated cheeses were on the whole somewhat heavier than the untreated, the difference amounting to from 5 to 9 per cent. The carbon dioxide distinctly improved the coagulating properties of milk at the lower temperatures, but its effect was hardly noticeable above 180° F.; it also appeared to prevent bitterness, but had a deteriorating effect on the colour of the cheeses.

Two experts were appointed to judge the cheeses and, excluding the results of July 12th, the pasteurised cheeses with and without carbon dioxide scored a total of 807 and 762 points respectively, while the controls only scored 759. The pasteurised cheeses were specially successful when the lower temperatures were employed and some first class cheeses were obtained under these conditions, their moist character giving them a very rich appearance; even with the higher temperatures, they scored a high percentage of points, the loss of points occurring chiefly on account of their mild and somewhat undeveloped flavour.

4. **Twelve Months' Meat Supply of the United Kingdom (1911-12).** — TURNBULL, R. E. in *Live Stock Journal*, Vol. LXXVIII, No. 2052, p. 119. London, August 1, 1913.

For the purpose of this account the term "meat" includes home-fed cattle, veal calves, fat sheep and lambs, bacon and pork pigs, and imported fat cattle and sheep and imported beef, veal, mutton, lamb, bacon &c. and hams.

The Home-fed supply. — The severe drought in 1911, and the consequent scarcity of food for live stock, naturally resulted in a large number of sheep being marketed for meat that would otherwise have been included in the sales of June, 1912.

The total number of sheep and lambs in June, 1911, was 30 480 000, whereas in June, 1912, the number was only 28 967 500, i.e. a reduction of 1 512 500. In addition to the usual supply of mutton and lamb, there was therefore that derived from over 1 500 000 sheep and lambs that were marketed because of the drought.

In June, 1911, the number of sows kept for breeding was larger than in any previous census, being 549 080, or 86 200 more than in June, 1910. These additional sows probably increased the supply of pigs in the twelve months ending June, 1911-12, by about 1 034 000.

The supply of home-fed fat stock, so far from being decreased by a severe drought, is usually largely increased, because stock are marketed in large numbers, but the cost of fattening is considerably increased, as more feeding-

stuffs have to be purchased, and home-grown corn has to be fed to stock that but for scarcity of keep could be sold.

Estimated Supply of Home-fed Stock.

	Number	Estimated av. dressed weight
Fat cattle	1 975 000	45 stones of 14 lb.
Veal calves	1 271 500	90 lb.
Fat sheep	10 692 000	68 "
Fat lambs,	2 380 000	40 "
Bacon and pork pigs.	6 305 500	1 1/8 cwt.
	<u>22 624 000</u>	

	Number	Estimated weight of dressed meat
Cattle and calves . . .	3 246 500	12 131 100 cwt.
Sheep and lambs . . .	13 072 000	7 979 100 "
Pigs (for bacon and pork)	6 305 500	7 566 600 "
	<u>22 624 000</u>	<u>27 676 800 cwt.</u>

Value: £87 182 000.

Imported Meat.

	Cwt.
Imported meat	20 938 007
Meat from imported stock	<u>326 193</u>
	<u>21 264 200</u>

Value: £47 545 500

Total Supply.

	Cwt.
Home-fed meat	27 676 800
Imported	<u>21 264 200</u>
	<u>48 941 000</u>

In the home supply the estimated weights of cattle and sheep exported are included in the above figures. After deducting the quantity of meat exported, the quantity consumed was :

	Cwt.
Home-fed meat	27 326 800
Foreign and Colonial	<u>20 928 400</u>
	<u>48 255 200</u>

This equals 118 1/2 lb. per head of the population (45 600 000).

In many countries population is increasing more rapidly than the herds and flocks. The high prices of fat stock now ruling are likely to be maintained for some time to come.

Well-bred herds and flocks in the hands of experienced farmers are a feeble and remunerative investment at the present time as can be found in connection with the land, and they continue to be the sheet anchor of the industry.

The Origin of the Industry and Trade of Cold-Stored Meat, especially in the Argentine Republic. — *Annales de la Sociedad Rural Argentina*, Year XLVIII. vol. XLVII, No. 1, pp. 52-60. Buenos Aires, January-February 1913.

The cold storage of meat, which is now recognized as one of the most important industries of the world and which supplies material for a most important trade between the various continents, is of quite recent origin, having arisen within the last thirty years.

Before entering into the causes of the development of this industry, the writer examines two interesting kindred subjects, one of which is the decrease of live stock in Great Britain during some decades previous to the introduction of cold-stored meat, and the other the canned meat industry in Australia.

It was naturally the demand for meat which caused the discovery of means of increasing the supply on the English markets. There are no reliable statistics available as to the numbers of cattle and pigs in the United Kingdom before the middle of the nineteenth century, the first live stock census having been taken in 1876. Nevertheless, according to Mulhall's fairly exact calculations for the decade 1851 to 1860 during which meat was not to be imported into the United Kingdom, the average production of mutton and pork for England, Scotland and Ireland was 900 000 tons, corresponding to 77 lbs. of meat per inhabitant. There was besides an importation of 43 300 tons of live stock which brought up the total to 81.4 lbs. per head. During the decade 1861-70 the average production rose to 1 000 000 tons and the imports to 129 000 tons. In 1882 the production was 1 073 000 and the imports rose to 643 700 tons, corresponding together to an average of 121 lbs. per inhabitant per year., of which quantity 46 lbs. were imported. The meat produced in England in 1882 consisted of 680 000 of beef, 300 000 tons of mutton and 93 000 tons of pork. The imports consisted chiefly of living cattle and sheep.

The following figures of the number of animals slaughtered in Great Britain — oxen, sheep and pigs, — give an idea of the decrease in the numbers of live stock between 1867 and 1880 and of the return to the figures of 1867 by means of the importation of animals and meat between 1880 and 1910.

1851 to 1853	40 676 000 (Mulhall)
1867	46 770 524 (official figures)
1880	42 974 261 "
1910	46 491 521 "

As for the importance of the quantities of meat imported into the United Kingdom during the last fifty years, it is sufficient to note that during the five years 1861-65 the average amount of imported fresh beef, mutton and pork was only about one tenth of a pound per inhabitant, while the im-

production of cold-stored meat in 1880 raised the average between 1881 and 1885 to 3.5 lbs., between 1891 and 1895 to 12.4 lbs., and between 1906 and 1910 to 28 lbs.

In Australia and in New Zealand about the year 1870 the number of live stock had increased very rapidly whilst the human population was still very sparse; the consequence was a fall in the prices of stock. It was between 1868 and 1879 that the trade in cold-stored meat sprang up, mainly after the experiments of Harrison and Mort in Australia, and of Tellier and Carré in France, and after the fortunate voyage of the steamship "Strathleven," had removed every doubt as to the practical application of the process. But before the trade in cold-stored meat had commenced, the exportation of canned meat had already developed in Australia. The first to use glazed earthenware vessels for preserving meat was a Frenchman, Appert, and the first mention of his method was made in 1809. Before that time glass vessels were used and afterwards iron ones (Heine's English patent No. 3310 in 1810). Tin cans were introduced in 1850 by the brothers Pellier. Liebig's methods also were adopted by the meat industry in Australia.

In 1850 there were 110 factories which boiled down meat for tallow. The sheep thus treated were 800 000 and the oxen 73 000 and the total product exported amounted to nearly 11000 tons. In 1851 the industry increased further and it is probable that 10 per cent. of the Australian sheep were destroyed by this ruinous process. The same system was adopted in New Zealand to utilize the surplus of stock.

The United States of America were the first to start the trade in refrigerated meat during the journey. The first exportation of chilled meat from the United States began in 1870. At the end of 1880, when the first cargo of Australian mutton arrived, Great Britain had already imported about 120 000 tons of fresh meat from North America.

Captain Nuflo Chaves introduced the first sheep into the Argentine Republic in 1550; the first cattle (seven cows and a bull) were imported by Juan de Salazar y Espinosa. The Spanish colonists settled along the Rio de la Plata and Juan Torre di Vega y Aragon, recognizing the favourable conditions of the pampas for live stock, divided among the colonists 4000 head of cattle and 4000 sheep. The animals multiplied rapidly and soon exceeded the requirements of the scarce population, which then began to think about the possibility of some exportation, limiting it however to hides. In 1616 the ship "Nuestra Señora de Refugio" left Buenos Aires with a cargo of 1281 hides worth 10 248 reales (about £270). In 1794 Manuel José de Labarden imported from Spain into one of the provinces of Rio de la Plata 10 Merino rams and 20 ewes and in 1813 Mr. Henry Le Halsey imported 100 head of this breed into the province of Buenos Aires. The first importation of English breeds was effected in 1825 with the Southdowns and the first importation of Lincolns took place in 1840.

In order to utilize commercially the enormous herds and flocks in almost wild in the Plata lands, factories for the salting of meat were established. The first was started in 1717 and the exportation of salted

pan. In 1822 the value of the hides, tallow and wool exported amounted about £650 000 per annum; as for salted meat, 35 220 tons passed through the Buenos Aires Custom House in 1862 and 42 397 tons in 1866. The importance of this industry is such that the number of animals treated in the "saladeros" is more than double that of those slaughtered for cold storage.

The first importation of Shorthorn cattle was effected by Don Juan Fernandez in 1865. Then followed the constitution of the "Rural Argentine Association", which marks the beginning of a series of intelligent and successful efforts for the promotion of a well organized animal husbandry. About that time the importation of pure bred animals of the best breeds began to be practised on a large scale with the object of improving the local breeds.

In 1868 the Argentine Government offered a prize of about £1600 for the most successful method of preserving fresh meat. In 1877 the Government suspended for five years the export duties on fresh meat and in 1882 abolished them finally.

The following figures taken from four official Argentine live stock returns give an idea of the progress of stock breeding in that country.

Year	Cattle	Sheep
1875	13 337 862	57 501 261
1888	21 963 930	66 701 097
1895	21 701 526	74 379 562
1908	29 116 625	67 211 754

In 1874 the exportation of live animals began, and by the end of 1879 about 1 000 000 head of cattle and 165 000 sheep had been exported. The first export made in 1876 by Charles Tellier with the steamship "Frigorifique" perhaps the first impulse to the creation of cold-storage establishments. The success of the "Strathleven" caused a greater stir and lastly the steamship "Paraguay", in 1883 with a cargo of cold-stored meat for the Old World marked the great exportation of fresh meat from the Argentine. This has resulted in a notable increase in the prices of live stock and has been a powerful stimulus to the improvement of the local breeding.

The exportation of fresh meat from Argentina was always mainly directed to the United Kingdom.

The "Financial Times", in reviewing the report on the trade of cold-stored meat in the United Kingdom during 1912, notes an increase in the exports from Argentina and states that the South American products amount to 1 per cent. of the meat consumed in England. It adds that probably the trade will increase still further in 1913 and that the prices will be higher than those of 1912. The figures published in England for 1912 show an importation into the United Kingdom of 1 580 648 quarters of frozen meat, an increase of 170 492 quarters over the previous year. Into the same country 2 220 697 quarters of chilled beef were imported, with an increase of 1531 quarters over the preceding year.

The exportation of frozen and chilled meat from the Argentine Republic during 1912 amounted to :

Frozen carcasses of mutton	3 584 927
Frozen quarters of beef	2 086 780
Chilled quarters of beef	2 269 474

On the whole the exports were higher than in 1911. There was an increase in the quantity of beef and a decrease in that of mutton. The number of animals slaughtered in the Argentine "frigoríficos" during 1912 was 1,417,213, and that of those worked up in the "saladeros" in the same time was 1,116,900, thus distributed : Rios, Argentina and Uruguay 363,000; Montevideo, 47,000; Frontera, 19,600; Rio Grande, 14,000. The exportation of live cattle in 1912 was 261,416 head, or 77,304 more than in 1911.

The export of "tasajo" (jerked beef) in 1912 was about 8,600. The exports of frozen and chilled beef during the month of January exceeded those of the corresponding month of 1912, while the amount of mutton exported was much less.

The numbers of animals slaughtered at the "frigoríficos" during the month of January 1913 were as follows :

Compañía Sansinena de carnes congeladas	30 360
The River Plate Fresh Meat Co	13 573
Las Palmas Produce Co.	12 407
La Blanca	19 859
The La Plata Cold Storage Co.	28 075
The Smithfield and Argentine Meat Co.	7 444
Frigorífico Argentino	8 627
La Prigorífica Uruguaya	4 472
Frigorífico Montevideo	5 263
	<hr/> 130 080

1091 - Good Wine and Bad Cellars. — MATHIEU, L. in *Revue de Viticulture*, Vol. XI, No. 1022, pp. 74-80. Paris, July 17, 1913.

After having reviewed the causes of the bad conservation of fine wine in the modern cellars of large towns subject to high temperatures and tremors, causes which act by favouring the multiplication of bacteria, the writer points out the real remedy for this state of things : To ensure the conservation of wines it is sufficient to prevent their being the seat of terrial diseases.

This result may be obtained in various ways :

1. By bottling them free from bacteria, either by a sterilizing filtration or by a perfect clarification ; but the contamination of the inside of the glass, of the corks, and even of the air in contact with the wine during the operation of bottling, must be guarded against.

2. By rendering the wine unfit for the multiplication of bacteria by such a high alcohol content as to be antiseptic ; this is the case of liqueur wines which are brought up to at least 17 or 18 per cent. of alcohol.

his process is not practical for wines for ordinary consumption nor those of great vintages.

3. Wines may also be kept at temperatures lower than those favourable to the vitality of germs, for instance below 10°C ., but this is a solution which can only be adopted by people who have such cool cellars.

4. Lastly the bacteria which are in the wine may be killed, so that the wine becomes independent of exterior conditions and of the constitution of the wine. In this manner any wine whatever, as well as milk, broth and most perishable food stuffs may be kept by destroying the bacteria and preventing new invasions taking place by contact with the air. As wine is kept in well closed bottles, it is enough to warm the corked bottles to a temperature of 65° or 70°C . in a water bath in order to sterilize at the same time the wine, glass, cork and air, if there is any in the neck of the bottle; in this way an indefinite preservation is ensured.

The experience of about half a century has recognized the value of pasteurization; experiments carried out at Bordeaux by M. Gayon have established with precision the conditions of temperature to be reached; numerous tests conducted at the Beaune Station have proved that the finest wines may be pasteurized without hesitation provided the operation be carried out with due caution.

This operation is very easy; and it does not require much or costly apparatus. It has been objected by some that the process gives a taste as of spoiled wine and that it causes a certain amount of breakage. No doubt such accidents do take place with inexperienced hands, but now-a-days it is very easy to pasteurize bottles even on an industrial scale.

The bottles are filled with wine and then well corked. They are then turned for a month on their sides, after which they are heated in a water bath, taking care not to plunge them into warm water if they are cold or viceversa. The temperature of the water should not be above 40 or 45°C . according to the initial temperature of the bottles. The corks must be fixed by a string or wire, because during the process of warming, the wine expands and the pressure would cause the corks to fly out.

As soon as a thermometer placed in a bottle of the same shape and capacity as the bottles containing the wine, but filled with water, shows a temperature of 65 or 70°C ., the bottles are to be removed from the bath. They are allowed to cool in the open, standing and not on their sides, or still better they are cooled in a tub by a current of water, taking care at first to mix the water with the warm water poured into the tub before placing the warm bottles into it. Care must be taken also that the necks of the bottles be out of the water; otherwise the contraction of the wine on cooling would draw water to enter through the fissures of the corks.

A temperature of 65 to 70° is sufficient to lower the vitality of all the germs likely to develop in wine and consequently it is sufficient to ensure indefinite conservation of the wine under any conditions. The wine may be sent any distance in the holds of ships, under tropical climates; it may be sent to the colonies and kept there, it may be carried on pack trains during the hottest days without any risk of deteriorating. That

is to say it may be kept equally well in any cellar with heating apparatus and gas or in the neighbourhood of the greatest traffic without suffering in any way; it will only grow old more rapidly.

1092 - **The influence of Some Elliptical Yeasts on the Constitution of Wines and other Fermented Liquids.** — VENTRE, JULES in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, New Series, Vol. XIII, Part I, pp. 19-67. Montpellier, July 1902.

This paper is a study of the influence of certain ellipsoidal yeasts on various natural media, such as the juice of black and white grapes of different concentrations of sweetness. The writer has made use of the most important yeasts of the southern districts, namely:

For red wines: 1) the yeast of Beaujolais; from the vineyards of Moulin à Vent, 2) the yeast of Burgundy from the vineyards of Roman Conti, 3) the yeast of Médoc from the vineyards of Margaux.

For white wines: the yeast of Verzenay (Champagne) from Chanc

According to the writer's preliminary experiments, these types may be considered quite fixed.

In the products of fermentation he has determined all the elements that can be separated by reliable methods: Alcohol, fixed and volatile acidity, dry extract and its principal constituents (glycerine, succinic acid, etc.) He gives an account of the methods of analysis adopted. In determining the influence of the ferments on the acidity he has made research on the constitution of the fixed acidity. By taking all these partial results together the writer was able to deduce conclusions showing at what stage the yeast was able to influence the medium in which it grew and give it a special character varying with the different species studied.

These conclusions are of theoretical and practical importance.

From the theoretical point of view they may be summarised as follows:

1. In any particular medium, yeasts do not all act in the same manner as regards either taste or chemical composition.

2. Some of them show a power of attenuating comparable to that of certain brewer's yeasts. This attenuation particularly that occurring in the yeasts of Verzenay, is concerned chiefly with the glycerine and succinic acid.

3. The Médoc yeasts always produce a larger dry extract than those found in the other media, but without any reducible matter being utilized.

4. Certain yeasts, those of Médoc in particular, have a special tendency to produce volatile acids.

5. The production by certain yeasts of volatile acids in considerable quantity is not connected with the presence in the liquid of pathogenic germs, such as that causing "tourne," which consume a portion of the sugar to produce volatile acids, thus reducing the alcohol content. It is then necessary to assume the presence of a distinct biochemical factor.

6. The fixed acids are attacked in different ways and to different degrees by various yeasts. Even tartaric acid, which is usually considered to be resistant to such decomposition, was changed by these organisms. Malic acid, however appears to be the most easily attacked and is

cific manner by each yeast. The yeast of Verzenay and Médoc are less
 ire with this acid than the others. This accounts for the fact that the
 ducts from musts treated with Verzenay yeast have a more acid taste
 n those treated with the Beajolais organism. When tested chemically,
 se products do not show any difference in their total acidity.

7. The quantity of ether produced in a wine appears also to indicate
 separate biological process. In fact there is not always absolute corres-
 pondence between the quantity of volatile acid determined and the quantity
 ethers formed. The Verzenay product shows also greater proportion of
 er than that of the other products.

From the point of view of the analysis of the wines, very interesting
 clusions can be drawn.

A natural wine treated with the Verzenay organisms and allowed
 ferment a short time would be spoilt and attributed to adulteration by
 addition of alcohol for the relation between the weight of alcohol and
 ract would be too great. In fact though the experiments on red wines
 de by the writer cannot be considered as typical of the entire vintage,
 y give results very similar to those of the rose-coloured wines. In this
 e if the ratio alcohol to extract is taken as 4.6, it is found that in the
 eriments of 1911 all the wines would be considered as having had 5
 7 per cent. of alcohol added to them.

From the practical point of view. A knowledge of the peculia-
 s of each specific yeast opens up a new field for the application of
 sts in wine making. Considering only the differences in the organo-
 ic characters given to the same media by the yeasts of Verzenay and
 ajolais, there is no doubt that in warm countries where a low acidity
 e general rule, it would be valuable to use a yeast, say that of Champagne,
 ch would preserve the maximum of the products. In cold countries,
 re the acidity is great, it would be necessary to add a yeast which
 raises the acidity.

The writer proposes to carry on researches with a view to determining
 exact condition for using these yeasts in wine-making.

1. Alcohol from the Fruit of the Strawberry Tree (*Arbutus Unedo*). —
 SANI, GIOVANNI In *Atti della Reale Accademia dei Lincei, Rendiconti*, Vol. XXII,
 Part 12, 1st Half-year, pp. 884-885. Rome, June 15, 1913.

According to the writer there are few forest trees that could give as
 and constant returns as the strawberry tree if it were systematically
 ivated and utilized. The analysis of its ripe fruit shows an average
 n content between the years 1905 and 1913 of 18.83 per cent. The experi-
 sts here mentioned were carried out in the laboratory of agricultural
 mistry at the R. Istituto Superiore of Perugia. On December 5, 1905,
 lbs. of fruit were crushed in a vat. Fermentation set in on January 7
 ended on the 22nd of the same month. *Saccharomyces ellipsoideus*
 the prevailing ferment, but there was also some *S. apiculatus*. The
 al expressed from the mass contained 10.5 per cent. of alcohol. On distil-

lation it yielded an alcohol possessing a delicate taste and the perfume of the fruit and which improved with age.

In successive experiments many hundredweights of fruit were fermented, the resulting wines containing from 9.15 to 9.75 per cent. of alcohol. Results of the analysis of one of the wines obtained by pressing the fermented mass are given in the following table. By partial rectification the wine obtained alcohol at 85°, which on being analysed gave the results given in the following table. According to the writer the preparation of this alcohol on a large scale could be carried out in favourable conditions.

Wine made from strawberry tree fruit.

Specific gravity	1.030	
Alcohol	9.15	per cent.
Total acidity	14.1	per thousand
Bitartrate	3.96	"
Tartaric acid	0.06	"
Volatile acidity	0.55	"
Tannin	0.781	"
Dry extract	102.20	"

Alcohol from strawberry tree fruit.

Acidity (as acetic acid)	gm. 0.132 gm. per li
Ethers (as ethylacetic ether)	" 1.757 " "
Furfural (with acetate of anilin and floroglucin)	present but not determinable by weight.
Methylic alcohol (Denigès method)	present
Free hydrocyanic acid	nil.
Combined hydrocyanic acid	"
Fusel oil (Röse's method, increase of volume, difference from pure alcohol 0.35 gm.)	gm. 2.321 gm. per calculated by Sell's law

1094 - **The Present State of the Industry of Esiccatng Forage.** — MEYER, in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 61, pp. 555-557. B. July 30, 1913.

Drying of Potatoes. — The methods adopted in practice for drying potatoes use hot gases, steam or hot oil. The first are especially employed for drying sliced potatoes and the others for potato flakes. For drying by means of hot gases, the esiccators used are those on the drum, trough and sometimes on the hurdle system, whilst for steam or oil drying roller esiccators are used (1).

The cost of drying by these various methods varies according to size of the plant and the duration of the work. The longer this is, the more the total expense per cwt. of potatoes. In the second place the cost is determined by the output of the plant, which in its turn depends chiefly upon consumption of coal. For this reason and especially in the manufacture

(1) For a detailed description of the various methods of esiccatng, see the work *Handbuch der Futtermittel- und Getreidetrocknung*, Leipzig 1912, (Jänekol).

flakes, motor engines that work well and at the same time supply the steam used in the drier must be used. In drying by means of the combustion gases a good utilisation of their heat must be attained. Besides, the cost of drying potatoes varies according to the starch content of the same potatoes and the water content of the dried potatoes. The greater the starch content of the potatoes, the less moisture is there to evaporate and the greater the quantity of dried potatoes turned out in a given time. With a good plant the average cost of drying is 4.18 *d* to 4.78 *d* per cwt. of raw potatoes if the gases of combustion are used, and 5.38 *d* to 6.18 *d* per cwt. with steam.

The utilization of raw potatoes by means of desiccation depends on the starch content of the tubers, the cost of drying, and the price of the dried potatoes when they are not consumed on the farm itself but get sent to market.

As dried potatoes are often used instead of foods rich in carbohydrates such as maize, barley and the like, their price must be considered in connection with that of these foods on the market. In the feeding of pigs, their price must be compared to that of oats. At a price of 7s 5.65 *d* per cwt. of dried potatoes and a cost of 4.78 *d* for drying, the writer considers that one hundredweight of fresh potatoes containing 16 per cent. starch gets paid 1s 4.85 *d*; if they contain 18 per cent. it gets paid 1s 4.8 *d* and 1s 9.8 *d* when they contain 20 per cent. At a price of 5.6 *d* per cwt, the prices are respectively 1s 7.84 *d*, 1s 10.71 *d* and 1s 12.2 *d*.

In selecting the method of drying to be adopted, the economical conditions and the uses to which the product is destined must be considered. The writer advises plant for the production of flakes, if potatoes are the only crop to be worked up and if they are to be used chiefly for feeding pigs, also if the plant is connected with a distillery or starch works or if the quantity of potatoes is not very considerable. If on the other hand besides potatoes, beet leaves, other forage or cereals have to be desiccated, and if the product is to be fed to horses, cattle and sheep it will be preferable to select a plant for the production of dried slices. As to the dimensions of the apparatus, it must be remembered that a large plant is not profitable unless the time during which it is worked is fairly long, namely from 150 to 180 days. In the case of cooperative drying the first thing to be done is to make sure of a sufficient quantity of potatoes to be dried. The writer considers that the high cost of cooperative drying is due to the fact that the time during which the plant works is too short.

When the quantity of potatoes to be dried is not enough to keep an independent plant going, recourse may be had to one attached to a distillery, dairy, etc. Before deciding, it is necessary to consider carefully all conditions.

The writer is of opinion that potatoes which are to be fed shortly after harvest to cattle, sheep and pigs should not be dried. On the contrary, those destined for horses should always be dried. Potatoes stored up to

the end of the winter suffer a loss of substance amounting to 8 and 10 per cent, and if they are not fed to the live stock until the spring summer the loss reaches as much as 25 per cent. Supposing the price of potatoes to be 18 *6d* or 2s per cwt. the loss would be 4 $\frac{1}{2}$ *d* or 6 *d* per cwt. The loss caused by storing is about the same as the cost of drying. When the prices of potatoes are low the cost of drying is not less than that of ensilaging, but drying affords the possibility of utilizing completely all the nutritive matter, and in years of abundant crops it saves the farmer from having to throw on the market large quantities of potatoes at a low price or to feed them wastefully to his stock.

Esiccation of Beet leaves. — Among the secondary products the residues of the cultivation of beets, the leaves present the greatest interest as to esiccation and this because their ensilage and their subsequent feeding to live stock present several drawbacks, amongst which particularly the loss of nutritive matter. This method of using them entails a considerable loss of money, as may be seen from the following figures: From 1910 to 1910 in Germany the acreage devoted every year to beets averaged 1 113 700 acres. Admitting the amount of leaves produced per acre to be 10 tons, the total crop would be 11 137 000 tons. If it be considered that two-thirds of this amount is ensilaged and that during this process one-third of the dry matter is lost, the loss amounts in round numbers to about 2.5 million tons of fresh leaves, or calculating that 5 tons of fresh leaves produce 1 ton of dried leaves, the loss amounts to about 1 million tons of dried leaves, worth about £1 200 000.

The esiccation of beet leaves is carried out chiefly in drum esiccators and sometimes also in hurdle esiccators. The various models of esiccators differ considerably from each other in the construction of the drum and the gradual passage through the drum of the stuff to be dried. The progress achieved during the last ten years in this field becomes evident if the composition and aspect of the product be considered. Formerly the dried leaves were hard and brittle, while now according to the latest methods the dried leaves have preserved their original green colour, they are soft, elastic, cleaner and possess a starch value of 35 to 38 per cent instead of 25 to 28 as formerly.

The cost of drying varies, as it does with potatoes, according to the size of the plant and the duration of the work, which, considering the losses which would be caused by rotting, cannot be extended at will beyond averages 70 to 80 days. On account of the shorter working period, the investment and amortization of beet leaf drying plant is fairly high. Whilst in potato drying about 2.39 to 3.59 *d* per cwt. are to be debited as general expenses, in beet leaf drying 5.96 *d* have to be debited. The writer believes that a notable diminution of general expenses is possible if the plant can be used also for other foodstuffs. Further the cost of drying is influenced also by the efficiency of the plant and by the amount of fuel consumed. If coal is used about 6.56 *d* to 7.15 *d* is required per ton of dried leaves. Using lignite the cost of fuel is less. Again the cost of drying varies with the amount paid for labour and the use of tea

rich may be set down at 4.48 to 5.96 *d* per cwt., and with the moisture content of the fresh and dried leaves. If the leaves are dried immediately after the harvest, the writer states that for the production of 100 lbs. of dry leaves containing 12 to 15 per cent of water, from 550 to 600 lbs. of fresh leaves are required. If on the contrary the leaves are left for a certain length of time in the field only 350 to 500 lbs., or an average of 450 lbs., are required to produce 100 lbs. of dried leaves. The question as to how far this artificial drying of the leaves may be carried without incurring too heavy a cost depends naturally upon the weather.

The cost of drying in an installation devoted exclusively to beet leaf drying ranges from 1s 5*d* to 1s 7*d* per cwt. of dried leaves. If other forage is dried also the cost diminishes.

As for the profitableness of drying beet leaves, the writer considers the best class beet leaves to possess about the same value as the best meadow hay. If the economic value of the latter be taken at 2s 6*d* per cwt., the value of the leaves, after deducting 1s 6*d* for the cost of drying, is 1s.

Assuming 450 lbs. of leaves partially dried in the field to be necessary to produce 100 lbs. of dried leaves, the cwt. of the former would be worth 13*d*, which must be considered as a favourable price. In view of this, and the disadvantages attendant upon an excessive use of silage, an extension of the practice of drying beet leaves is justified, especially in breeding farms in which ensilage is often injurious. In milk farms on the contrary, where milk and dairy produce command only medium prices, the use of dried leaves is, according to the writer, of limited advantage because the successful production of milk depends only very partially upon the feeding of concentrated foods. Nevertheless here also esiccation allows of a better utilization of the beet leaves.

Drying of sugar-beet and mangold slices.—In this field the technique of preservation has not achieved any considerable progress recently. The number of sugar factories which have erected drying installations has undoubtedly increased of late, which speaks for the recognition of the importance of the drying of the slices.

The market price of mangold slices was, during recent years, higher than their economic value, which was 3s 9*d* to 4s per cwt. The price of sugarbeet slices stood also higher than their nutritive value.

In conclusion the writer speaks of the drying of yeast, a subject which has already been treated in detail in this Bulletin (1).

(1) See B. May 1913, p. 692: "The Development of the Dried Yeast Industry in Germany", by Dr. F. Hayduck.

PLANT DISEASES

GENERAL INFORMATION.

1095 - Proclamation Regarding the Importation of Potatoes into Western Australia. — Extract from the *Government Gazette* of November 22, 1912.

The Governor revokes the Proclamation published on April 19, 1909, and makes the following regulations:

The introduction into Western Australia of any potatoes the product of, or directly or indirectly from, the State of Queensland is prohibited absolutely.

The same prohibition extends to potatoes coming directly or indirectly from the States of New South Wales, Victoria, South Australia and Tasmania, except in accordance with regulations made by Order in Council under the "Insect Pests Amendment Act, 1898".

The ports Eucla, Esperance, Hopetoun, Fremantle, Perth and Georgetown and all ports north of Geraldton are to be the only ports of entry for potatoes and potato bags.

It is absolutely prohibited to bring potatoes, or second-hand potato bags, from any other portion of Western Australia into all that part of Western Australia which is bounded by a line commencing at the sea-coast at Rockingham, and extending along the north boundary of Rockingham, and thence extending in a straight line to the south-west point of Mundijong townsite, and thence in a straight line eastward to the southerly point of Beverley townsite, and thence eastward to the 119th degree of East longitude, and thence south along the said meridian to the coast, and thence following the sea-coast westward and northward to the starting point.

With the consent in writing of the Minister for Agriculture, seed potatoes, the property of the Department of Agriculture may be brought into the area described.

The introduction is prohibited into Western Australia, from the States of New South Wales, Victoria, South Australia, Queensland, and Tasmania, of second-hand bags that have been used for the carriage of potatoes, or empty or containing goods. Empty bags may, however, be introduced into the port of Fremantle, if disinfected according to regulations made under the Act of 1898.

This Proclamation shall have operation and effect on and from the date of its publication in the *Government Gazette* of November 22, 1912.

6 - The Obligatory Destruction of the Stinking Mayweed (*Anthemis Cotula*) in the District of St. Leonards, Tasmania. — BLACK, R. A., Federal Quarantine Officer (Plants, etc.). — *The Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, pp. 165-169 + 1 plate. Hobart, May 1913.

At the request of the Municipal council of St. Leonards, the stinking mayweed (*Anthemis cotula* L.) was proclaimed on the 27th of March 1913 a noxious weed for its municipality, under section 6 of "the local Government Act 1906" (6 Ed. VII, No. 31). It has also been proclaimed for several years in Victoria and New South Wales.

This weed grows in profusion on roads where either side is grassed. Experiments carried out in America, its seed has been found to be viable after 25 years. It was imported into Tasmania mixed with other seeds and is a prohibited weed under "The Federal Quarantine Act, 1908", which means that the importation of the plant or its seed from any part of the world into Australia is forbidden under a severe penalty. It now incumbent upon the Municipal Council of St. Leonards to take action for the eradication of this weed. Every occupier of land who does not destroy the stinking mayweed on his property is liable to a penalty not exceeding £20. Any person who knowingly sells hay, straw, or grass seed or any seed of grain containing seeds of *Anthemis cotula* L. is, liable to a penalty not less than forty shillings nor more than twenty five pounds.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

97 - Floral Abnormalities in Maize, which appeared spontaneously in France in 1912. — MURCE in *Bulletin des séances de la Société Nationale d'Agriculture de France*, Vol. LXXIII, No. 4, pp. 292-295, 3 figs. Paris, April 1913.

Abnormalities in the flowers of maize have been so numerous in some districts of France as to have assumed the proportions of a calamity.

In some cases, female spikelets have been substituted for the male spikelets of the base or the summit of the ramified panicle; in others the normal stems have been transformed into mal-formed bunches; while complete metamorphosis has resulted in a single terminal ear of irregular shape the indented seeds separated by the glumes of persistent female flowers. This metamorphosis has often been associated with abundant tillering, insufficient ripening, as well as reduction or abortion of the seed.

In spite of the removal of abnormal stems during hoeing, those remaining at harvest formed two-thirds of the crop.

The disease seems to occur independently of any traumatism; and is due to a disturbance of the physiological equilibrium, in the form of an excess of nutrition due to a large amount of nitrogen, and especially abundant rainfall. The correctness of this hypothesis seems to be proved by a similar observation made by the writer. On soil which had been continuously cultivated for 12 years without being manured, the maize

crop showed every year the opposite modification to that just mentioned viz the female flowers were converted into male flowers. This kind of sex retrogression appears to be the result of a deficiency in the food supply. The regulation of the latter is the best means of diminishing the frequency of these abnormalities.

1098 - Studies on the Water Core of Apples. — O' GARA, P. J. in *Phytopathol.* Vol. 3, No. 2, pp. 121-128 + 12 figs. Baltimore, 1913.

Water core is a disease which occurs more or less generally in all districts of the United States, particularly in the arid and semi-arid parts. It has also been recorded in Europe, Asia and Africa.

The writer has done considerable work on this disease during the past few years. Some European writers have held that water core is caused by bacteria, although others have shown that the trouble is not due to a parasitic agency. All the methods known to modern bacteriology, especially those used in the study of ultra-microscopic organisms, have failed to show the presence of any organism. The inoculation experiments of the writer afforded no positive results.

The affected apples have hard watery areas extending outwards from the outer edges of the seed cavities. In the beginning stages, the first appearance of water core is in connection with the vascular system. Later the seed cavity usually contains liquid and the hard inner membrane of the carpel is cracked and covered with hair-like growths, the fruit has a somewhat sweetish fermented flavour, and the watery parts contain more sugar and less acid than the normal or unaffected parts. It is during the later stages of the disease that fungi and bacteria are present. *Alternaria* sp. is a common intruder and produces a serious core rot. The *Alternaria* infection may be prevented by the application of Bordeaux mixture.

The most prominent factors inducing water core are: 1) excessive strong vegetative growth, especially in young trees just coming into bearing; 2) high cultivation and the consequent retention of moisture in the soil; 3) excessive precipitation or irrigation shortly before the maturity of the fruit, if followed by great differences in the day and night temperature and atmospheric humidity (the fruits most affected are those farthest from the terminals and those on the south or south-west sides of trees); 4) severe pruning shortly before the ripening period, or defoliation by disease or otherwise; 5) frosts; 6) rapid conversion of starch into sugar.

In a heavily irrigated orchard, 90 per cent. of the fruit became water-cored, and in one which was severely pruned during the latter part of August nearly all the crop was similarly affected, while in neighbouring orchards growing under the same conditions as regards the soil and the variety cultivated, 5 per cent. and none of the fruit was respectively attacked.

In order to prove that it is universally true that water core is more liable to occur in exposed fruits, the writer had a large number of apples picked from the south and south-west parts of trees, and others taken from unexposed positions. In the former case, 90 per cent. of the fruit showed water core, while less than 5 per cent. were water-cored in the latter

The degree of alteration is in proportion to the exposure of the fruit to extremes of temperature and humidity. Usually, water-cored apples have a much higher colour than those not affected.

Under proper storage conditions, water-cored fruit, unless badly diseased, will entirely recover. This will be the case where no liquid fills the seed cavities, and if the fruit is placed in a cool even-temperated place (not cold storage). This shows the non-parasitic nature of the trouble. As soon as it is found that apples are becoming water-cored, they should be immediately picked and placed in proper storage.

In an experiment, 1000 boxes of Newtown apples, of which fully 90 per cent. were water-cored, were stored for about three weeks. At the end of this time, the fruit was again examined, and scarcely 1 per cent. were affected. The only cases not fully recovering were those in which the seed cavities had become filled with liquid.

BACTERIAL AND FUNGOID DISEASES.

9. — Pure Cultures of *Phytophthora infestans* De Bary, and the Development of Oospores. — PETHYBRIDGE, GEORGE H. and MURPHY, PAUL A. in *The Scientific Proceedings of the Royal Dublin Society*, Vol. XIII (N. S.), No. 36, pp. 566-588 + Plates XLV-XLVI. Dublin, 1913.

In the case of *Phytophthora infestans*, the parasitic fungus which causes potato blight, the study of the life-history of the parasite has failed to deal with any certainty any stage in which sexual organs are produced, though many of its allies amongst the Peronosporaceae have been shown to produce such organs.

The writers consider that, in studying the life-history of a parasite, it is not sufficient to obtain the details from the latter as it grows upon its host, but the fungus should be grown as a saprophyte on a suitable artificial medium as it is possible that, under these conditions the organism may show stages in its cycle of development which are not produced during its career as a parasite.

An account is given of previous experiments undertaken for the purpose of obtaining suitable substrata for *Phytophthora infestans*, and a detailed description of the pure cultures and the technique employed in the several cases follows.

In some pure cultures, *P. infestans* did not form sexual organs, in others it formed sexually produced spores, or oospores; thus the work of Clinton is confirmed. Whether, however, these spores are *strictly speaking* formed sexually or not — that is whether an actual process of fertilization occurs or not — cannot be decided at present. Clinton (1911) found that in the absence of antheridia, the oogonia did not do more than develop oospheres, but Messrs. Pethybridge and Murphy observed that in at least one-third of the cases examined under such circumstances, both in Clinton's medium and their own, oospores were produced; they looked upon such spores as having been formed parthenogenetically. These spores resemble those formed when an-

theridia are present, except that in many cases their walls appear to be slightly less thickened.

Even when antheridia are present, it is difficult to see how the oosphere can be fertilized, for it is completely shut off from the antheridium by the funnel-shaped base of the oogonium and no signs of a fertilization have been observed. It is of course possible that a union of the male and female elements may occur soon after the entrance of the oogonial invagination into the interior of the antheridium, but if fertilization occurs at this stage it occurs *before* the formation of the oosphere, which would represent an unusual state of affairs.

Clinton was not able to trace the points of origin of the oogonia and the antheridia, but states that they seem to arise on separate hyphae. The observations of the writers show that this is actually the case, and moreover they explain Clinton's difficulty in finding antheridia except such as were in contact with oogonia which were already well on in their development. Clinton states that the antheridia observed by him often show the *superimposed* "oogonial thread", but the writers find that this structure, which is in reality the lower part of the oogonium itself, is actually within the antheridium and not superimposed upon it.

Whether the fungus produces oospores in the potato plant or not, must have to be settled by further research. The writers (like the other investigators) have found thick-walled spores in the tissues of various parts of the potato plant which have been destroyed by *P. infestans*; these may possibly have been such bodies, although as a rule they appear to be smaller than the spores obtained in pure cultures. Many of them too have been seen to be surrounded by a kind of halo of brownish material which may possibly be the remains of the oogonium wall. If such bodies are produced in the potato-plant, they would doubtless find their way to the soil and probably play an important part in keeping the fungus alive over the winter and in causing infection of the potato crop during the following season.

1100 - Factors affecting Susceptibility to Disease in Plants. — SPINK, G. I.
The Journal of Agricultural Science, Vol. V, Part 3, pp. 231-247, plate
Cambridge, June 30, 1913.

From experiments on the effect of mineral starvation on species of *Bromus*, Marshall Ward concluded that decreased susceptibility to rust was only caused by the lack of sufficient food in the host plant on which the fungus could feed.

In order to study the question more closely, the writer made some experiments under different conditions of nutrition:

- a) With wheat plants grown in nutritive solutions and attacked by mildew (*Erysiphe graminis*).
- b) With the same wheat grown in boxes of soil.
- c) With cultures in nutritive solutions, using wheat plants of different varieties with different powers of resistance, and both inoculated with uredospores of yellow rust (*Puccinia glumarum*).
- d) With pot cultures of the same wheats.

e) With pot cultures of wheat attacked by *Erysiphe graminis* carried on the farm of the Royal Agricultural Experiment Station at Woburn.

f) With experiment plots of wheat and barley at the same Station. Cereals were attacked by mildew and by *Puccinia graminis*.

The conclusions which can at present be drawn from these investigations may be shortly summarised as follows:

I. Susceptibility to mildew and yellow rust in wheat, and to mildew in barley, is increased by providing the plants with large amounts of available nitrogen; ammonium sulphate and sodium nitrate seem to be particularly effective in this direction.

II. Mineral manures especially potash salts, on the contrary decrease susceptibility to disease, but cannot counteract the effect of large quantities of nitrogenous manures.

III. Plants which are semi-starved as regards nitrogen exhibit a considerable degree of immunity, even if the phosphates and potash are present only in small quantities.

IV. Lithium salts are also effective in producing immunity, while salts of lead and zinc, particularly the latter, render plants extremely susceptible. Other salts of lead and zinc have very little effect on the susceptibility of plants.

V. A variety of wheat which is almost immune to a disease (such as yellow rust) tends to retain its immunity even when supplied with excess of nitrogenous food-material.

VI. Increased immunity does not appear to be due to a lack of food material available for the fungus in the host, as suggested by Marshall, because the plants rendered relatively immune by adding phosphates or potash to their food-supply were as healthy and well-grown as those receiving no such additions.

It yet remains to be seen what physiological explanation can be found to account for the changes in susceptibility to certain diseases which can be induced in some cultivated plants by the use of certain fertilizers, and of certain chemical substances used as fertilizers.

- A Preliminary Note on a Bacterial Disease of Fruit Blossom and Foliage. — BARKER, B. T. P. in *The Gardener's Chronicle*, Vol. LIII, No. 1375, p. 287. London, May 1913.

Early in April 1913, many blossom trusses of pears showed signs of discoloration and blackening which is commonly attributed to frost or cold winds. The weather at that time was not, however, severe enough to have caused the damage, further, the extent of the trouble varied considerably, both on similarly situated bushes of the same variety and on adjoining branches of the same bush, while the styles and stigmas of many flowers were completely discoloured when the flower was still an unopened bud and showed no external sign of damage.

On microscopical examination of the injured flowers, large numbers of small rod-like bacteria were found in the discoloured areas. That the disease could be produced by inoculation was proved by experiments.

It seems certain that a very large percentage of the damage hitherto regarded as due to low temperature effects must be attributed to the action of the above-mentioned bacillus, which must be widely distributed in England, judging from the large number of trusses of affected pear blossom sent to the writer. It appears that this is the first record of the occurrence of this organism as the cause of pear blossom disease. Its cultural characters and the nature of the disease produced by this parasite prove it to be quite distinct from *Bacillus amylovorus* De Toni, described by Whetzel and others as the cause of "fire blight" of pears. The leaves and all parts of the flower are attacked by the organism. Whether or not it attacks the shoots and branches of the tree is at present uncertain. In the case of the variety Catillac, many developing buds have been found seriously injured.

The disease may possess considerable importance in connection with investigations on self-sterility and other fertilisation problems of varieties of different fruits.

1102 - *Cryptogamic Diseases Observed at Barbados, West Indies, in 1911-19*

See below No. 1113.

1103 - *Ophiobolus herpotrichus* and Straw Blight of Wheat. — VOGES, B. in *Zeitschrift für Gärungs-Physiologie*, Vol. III, Part 1, pp. 43-83, figs. 1-5, Berlin, 1911.

The supposed agent of wheat straw-blight, *Ophiobolus herpotrichus* Fries, appears from the month of June upon the stalk, leaves and shoot at the base of the whitened stem of the dead wheat plant. It occurs in the form of a stroma covering the nutritive substratum like felt. In a damp chamber, the hyphae of this stroma, when lately formed, produce conidiophores of *Fusarium rubiginosum* App. and Wollw.

On artificial nutritive media, the ascospores of the fungus germinate in a quite irregular manner. Some of them, after producing bodies resembling spores, take the form of a durable mycelium. This fungus possesses two kinds of mycelium: one durable and thick-walled, brownish yellow and thorn-like, the other finely filamentous, delicate, and light-coloured. The first corresponds to the mycelial covering of the lower internode of the stalk, and is characteristic of wheat straw-blight; the second kind of mycelium bears as reproductive bodies the conidia of *Fusarium*.

If the mycelium of *Ophiobolus* grown on a culture medium is transported on to young wheat plants which have been well boiled, a luxuriant growth of *Fusarium* results, and the brown mycelial covering appears on the stalks just as it does in the open in the case of wheat attacked by strawblight.

The *Fusarium* resulting from the culture of the ascospores of *Ophiobolus herpotrichus* is *F. rubiginosum* the so-called "Schneeschimmel". The fertile form of *O. herpotrichus* is very probably *F. rubiginosum* and as has hitherto been supposed, *Hendersonia herpotricha* Sacc.

According to the writer, the yellowish-green mycelial covering which appears on the lower internode of the stalks of wheat plants that have died prematurely and bear white empty ears, is not characteristic of straw

light, since alongside of these plants with white stalks covered with mycelium, almost as many are found which have turned yellow prematurely and have died, though free from any coating of the mycelium in question. Thus *O. herpotrichus* cannot be regarded as the specific agent of straw-rot. The disease may arise from different causes; it occurs especially as a result of injury due to frost. *O. herpotrichus* is not a definite enough parasite to be able to penetrate directly into the healthy tissues of the wheat plants, and it is only when these are weakened by other causes, by meteorological agents and the attacks of nematodes in particular, that the fungus succeeds in affecting an entrance. The appearance of the mycelial covering is a secondary phenomenon and is chiefly formed by the durable mycelium which becomes entangled and intergrown with the filaments of *cladosporium herbarum* Link. and *Mucor racemosus* Presen. According to the writer, the conidial form *F. rubiginosum*, which successfully attacks plants that have been already weakened, is more to be feared than *O. herpotrichus*.

4. - A Dry Rot of Sweet Potatoes Caused by *Diaporthe Batatis*. — HARTER, L. L. and FIELD, ETHEL C. — U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 281, pp. 37 + figs. + 4 plates. Washington, May 1, 1913.

This disease was observed for the first time in 1890 in New Jersey and is attributed to an undescribed species of *Phoma* to which the name *Phoma batatae* was subsequently assigned. As the rot occurred only occasionally, it was not considered of much importance and during the 22 years which have elapsed since its discovery it has not been made the subject of further study. According to the writers, the damage occasioned by this disease is greater than is supposed, as its ravages are often attributed to other causes, such as stem-rot, black rot, or even drying up owing to lack of moisture. Of late years, this disease has been recorded from New Jersey, Virginia, Mississippi, Texas, Alabama, Indiana and North Carolina.

The writers describe the course of "dry rot" in the hotbed (a yellowing of the stem preceding the formation of pycnidia), in the field, where the pycnidia do not form until the plants are in a weak or dying condition, and in the store-house where the first symptoms appear from four to six months after digging. The stored tubers show the characteristic dried, shrivelled appearance starting at the stem end and gradually extending through the tissue. Later they become hard and mummified.

The bulletin contains an account of the different stages of the life-history of the fungus and gives the synonymy of the organism. The parameters of the latter was proved by inoculation experiments, and its behavior on different culture media was ascertained, as well as the influence of moisture on the growth and formation of its fruiting bodies.

The writers sum up the results of their investigations as follows:

The ascogenous form of the organism causing dry-rot of sweet potatoes is *Diaporthe* and has been given the species name *batatis* by the writers. The pycnidial stage was first described by Ellis and Halsted as *Phoma batatis* but the imperfect stage has been considered in the present work as belonging to the form genus *Phomopsis*. The disease is chiefly a storage

trouble. It is characterised by a drying and shrivelling of the potato, the surface of which appear many small pustules — the pycnidia lying close together and eventually covering the whole surface. The disease occurs also in the hotbed and in the field. The organism is not a vigorous parasite, and consequently under ordinary conditions does not become evident until some time after harvesting. Diseased vines have been collected in abandoned hotbeds.

The pycnidial stage develops from the ascospores in 6 to 10 days. Ascospores are formed from the ascogenous strain in 4 to 6 weeks on cereals but they are always preceded by the formation of pycnidia. Both stages were derived from the same isolation. Inoculations with pure cultures of the pycnidial stage both in the greenhouse and in the field gave successful infection. Successful infections were also obtained from re-isolations. Inoculation on the Potomac Flats with pure cultures of the ascogenous strain gave successful infections. Isolations of the organism were secured from planted plates from green stems of infected plants. Pycnidia, however, were only on the dead or moribund tissues. In the greenhouse, pycnidia occurred on the leaves, stems, and roots of inoculated plants. The ascogenous stage fruits well on all cereals tried (corn meal, rice, wheat, barley, oat, rye, buckwheat) and sparingly on sweet-potato cylinders and sweet-potato stems. The disease is disseminated chiefly by the "seed" and by the use of decayed potatoes for manure. Diseased potatoes should be cooked before feeding to stock. They should never be scattered on the fields as fertilizer. Seed beds should be sterilized and potatoes to be used for seed carefully selected.

1105 - On the Rotting of Potato Tubers by a New Species of *Phytophthora* having a Method of Sexual Reproduction hitherto Undescribed. — PEARCE BRIDGES, GEORGE H. in *The Scientific Proceedings of the Royal Dublin Society*, Vol. X (N. S.), No. 35, pp. 529-565 + plates XLII-XLIV. Dublin, March 1913.

The writer in his introduction gives a short summary of the literature dealing with the various forms of rotting which occur in the potato tuber. In some cases, it is probable that potato tubers sometimes die what may be called a natural death, or at least one in which the active participation of parasitic organisms does not occur; but, as a rule, the rotting of potatoes is nowadays regarded as the direct result of the attack of some parasite. Animal pests frequently cause wounds in the skins of the tubers and thus facilitate the entrance of bacteria and fungi. A considerable number of bacteria have been described which are pathogenic to the potato tuber; these must now be added *Bacterium xanthochlorum*. There are relatively few fungi which have been proved to be the primary causes of potato rot, the best known being *Phytophthora infestans* De Bary.

Dry rot is generally regarded as caused by *Fusarium Solani* Sacc., in view of the recent work of Appel and Wollenweber, it is possible that this disease may be due to more than one species. "External dry rot" has been shown to be caused by *F. trichothecioides* Wollenw.

Frank has credited *Hypochnus Solani* Prill. and Del. (= *Rhizoctonia* Kühn) with producing wet rot in potato tubers; the evidence he has put forward was, however, inconclusive, and the writer failed in producing the disease by means of inoculation with this fungus. *Rhizoctonia violacea* is an actual parasite on the potato tuber.

The present paper deals with a new and highly characteristic type of wet rot which occurs in Ireland (and will probably be found to occur elsewhere) caused by a new species of fungus closely allied to *Phytophthora infestans*, but differing in certain important essentials from the latter. It was first observed in 1909 in plots at the Temporary Station for the Investigation of Plant Diseases established by the Department of Agriculture and Technical Instruction for Ireland at Clifden, Co. Galway, and has since been given from other parts of the country. During the last two seasons, the disease has become of increasing virulence. It is prevalent in the West of Ireland and it seems that the loss in tubers occasioned may be considerably greater than that due to the attacks of *P. infestans*. The disease is particularly virulent on certain portions of land which have been continuously cropped with potatoes (infection taking place from the soil), and it did appear to be quite easy to prevent its occurrence by following a regular rotation of crops, and planting only potatoes derived from clean land. The infection is probably to be accounted for by the fact that some of the "rest-spores" of the fungus adhere to the external surfaces of the "seed" tubers; it seems fairly certain that the disease cannot be transmitted by the presence of the fungus within the tubers, as the rot caused is so rapid that the tubers are destroyed in a few days.

A preliminary notice respecting this disease has been published in the *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XII, No. 2, 1912, p. 375.

The method of the development of the sexual organs of the fungus is peculiar and novel. The writer suggests the name *P. erythroseptica* for this hitherto undescribed species of *Phytophthora* and that of "pink rot" for the disease which it occasions. A detailed description is given of the symptoms of the rot, which usually begins at the proximal end of the tuber and progresses rather quickly towards the distal end. In the field or store the tubers would probably be regarded as of the "wet" type. The cut surfaces of infected tubers quickly turn pink when exposed to the air, and later become almost black.

The pathogenetic agent has been isolated by placing pieces of infected tubers in suitable media; when inoculated into healthy tubers, the latter become infected. No infection followed in carrots and parsnips, while in the cases of the mangel and swede the rot was neither very rapid nor pronounced. In the white turnip a decided rot was produced, but its progress was not so rapid as in the potato. Inoculation experiments with scarlet runner beans showed that the fungus was incapable of causing infection through the uninjured skin of the pods.

The writer gives a detailed description of *P. erythroseptica* and its sexual organs. The oogonial incept enters the antheridium at or near its base,

grows up through it and out of the top, expanding there to form the nium proper in which the oospore develops. It is not certain whether fertilization occurs, but if so it would appear to take place before the formation of the oosphere. The production of oospores and conidia has not been seen in or on the potato tuber itself, but it has been observed in cultures grown on various media. *P. erythroseptica* can be cultivated on such media much more readily than its near ally *P. infestans*. It would appear that the production of oospores is inhibited by acid, and that the conidia are not produced only under water.

P. infestans de Bary and *P. Phaseoli* Thaxt. agree with *P. erythraea* in the manner in which the oospores are produced, while it is highly probable that *P. omnivora* var. *Arecae* Coleman will be found to follow the same mode of development. The sexual organs of *P. Cactorum* Schroet., *Peronospora Fagi* Hartig (*P. omnivora* De Bary) and *Phytophthora Syringae* Klebahn developed in the manner described by De Bary for his *P. omnivora*, and is usually regarded as typical for all species of *Phytophthora*. The writer suggests that only those species whose sexual organs are developed according to the *infestans*-type should be retained in the genus *Phytophthora*, that those which follow the *Cactorum*-type should be placed in a new genus for which the name *Nozemia* is proposed. The genus *Phytophthora* as amended is to constitute, at present, the sole member of the family *Phytophthoraceae*.

An addendum gives further information as regards *P. Faberi*, *P. tianae* and *P. Jatrophae* when grown in pure cultures. The bibliography appended contains 26 works.

1106 - On *Phytophthora parasitica* nov. spec., a New Disease of Castor Oil Plant. — DASTUR, JEHANGIR FARUNDJI in *Memoirs of the Dept. of Agriculture in India, Botanical Series*, Vol. V, No. 4, pp. 177-231 + X plate coloured. London, May 1913.

Hitherto Castor rust (? *Melampsorella Ricini* de Toni) is the only important fungus pest which has been recorded as attacking the castor oil at Pusa, and yet two other serious parasites occur there: one is *Phytophthora parasitica* nov. spec., the other is a species of *Cercospora*. The latter attacks the leaves only, but in wet weather about 90 per cent. of the foliage of the castor oil plant is covered with *Cercospora* spots, which is a serious menace to the eri-silk industry. Further in August and September *Choanomyces* attacks leaves, growing points, and tender shoots, while there is also a *ternaria* found occurring on the leaves which might be parasitic. All these cases will be dealt with in another paper when their study is completed.

Phytophthora on castor was first found at Pusa in 1909 in August. Since then it has been found to appear every year after the rains have set in in June, while the disease disappears by the beginning of September, at the onset of the rains. About 19 varieties of castor were grown on the Pusa field in 1911, but none of them escaped the attack of this fungus. *Phytophthora parasitica* is the most injurious of the fungal parasites of castor; it destroys seedlings and attacks leaves of older plants. The silkworms refuse to

diseased portions of the leaves and their growth when fed on diseased juice is very slow as compared with those fed on healthy leaves.

In the case of a monsoon (Kharif) crop, the most critical time is when seedlings are about six to eight inches high and their stems are quite tender. In low-lying, water-logged, and badly drained fields, about thirty per cent. of the seedlings damp off. The first indication of the disease is the appearance of a roundish patch of an unhealthy dull green colour on both surfaces of the cotyledon, which soon hangs down from its point of attachment. The disease spreads from the leaf to the petiole, thence to the stem and the growing point, killing the seedling. In older plants, the disease in the field is localised on the lamina. As the diseased spot gets older it turns yellowish and then brown. It spreads concentrically, and in old plants forms concentric brown rings enclosing lighter brown areas. Sometimes the diseased areas become confluent. The affected leaves have a tendency to fall off prematurely.

The mycelium is both intracellular and intercellular. The long unbranched sporangiophores emerge through the stomata, or between the cells of two contiguous cells. Internal sporangia have often been observed in the tissues of the leaves, stems and fruits; in a few cases they have been found to germinate conidially in the soft tissues of the pericarp of the fruit. The writer has, so far, failed to find typical oospores in nature.

Inoculation experiments were made using a fragment of diseased leaf, the mycelium, or zoospores from cultures of the fungus. In all cases the effect of the inoculation was clearly perceptible within 24 hours, and sporangia were produced in 48 hours after the operation, provided the inoculated leaf was kept moist. The germ tubes of the zoospores penetrated the leaf, either through a stoma, or by breaking through the upper wall of epidermal cells, or by penetrating between the walls of two neighbouring cells. Infection experiments were also successful in the case of flowers and fruits, though these are not attacked under natural conditions. Seedlings sown in infected soil gave first positive results, and subsequently negative results at the end of two months; this shows that the fungus in the soil is not able to retain its vitality for two months.

The writer describes in detail the technique of pure cultures, the morphology of this fungus in culture as compared to that of its allies, the different nutritive media used and the inoculation experiments carried out on various host plants by means of suspending motile zoospores of *Ph. parasitica* (obtained from pure cultures) in distilled water. The results were positive in the cases of young plants of *Solanum tuberosum* and of seedlings of *Lycopersicon* and *S. Melongena*. The disease remained localised on inoculated mature leaves. Potato tubers could be inoculated only through wounds; tomato fruits could not be inoculated, even when wounded, and in no case was there any formation of sporangia. Lilac plants did not take inoculation vigorously. Two species of *Oenothera* were readily infected by inoculation, as were young seedlings of *Salpiglossis variabilis*, *Gilia* and mixed species, *Clarkia elegans*, *Schizanthus retusa* and mixed species and *Fagopyrum exilimum*. About fifty per cent. of *Sesamum*

indicum sown in a field where castor was grown the previous year attacked by *Phytophthora*, and successful cross inoculations showed the fungus was the same as the castor *Phytophthora*. Negative results were obtained by inoculating *Opuntia Dillenii*, two species of *Coccoloba* fruits and apples, *Colocasia antiquorum*, *Lepidium sativum*, *Phytolacca*, tobacco, *Cleome* sp., four species of *Jasminum*, *Phaseolus lunatus* and *Phaseolus vulgaris*.

The infection experiments showed that some of the plants that are susceptible to infection by *Ph. omnivora*, *Ph. omnivora* var. *Arecas* *Ph. Faberi* can be inoculated also by *Ph. parasitica*.

Nevertheless, the study of these fungi in pure cultures showed little in common between them; the latter is distinguished from the others especially by the method of the development of its sexual organs. Other *Phytophthora* except *P. Colocasiae* has the oogonium been invariably found to originate from within the antheridium, or to arise from a separate stalk which penetrates the antheridium and grows through it.

After establishing the differences between *Ph. parasitica* and its allies, the writer gives a botanical description of the former.

1107 - Diseases of Rubber, Cacao and Cotton Observed in Southern Nigeria in 1912. — Annual Report on the Agricultural Department for the Year 1912, 1913

The fungus flora so far observed of economic plants in Southern Nigeria is very similar to that of Southern India, Ceylon, Malaya, and the East generally. The following diseases have been recorded. Mr. C. O. Farquharson, mycologist of the Agricultural Department, Southern Nigeria, in the course of his tours of inspection in the different districts.

Rubber Diseases. — Two fungi have been found in the colony causing decay of the roots of the Para trees (*Hevea brasiliensis*); these are *Fomes semitostus* Berk. (*Polyporus lignosus* Klotzsch) and *Hymenochaete noxia* Berk. The best method of controlling the first is to get rid of the infected material, to treat the soil with quicklime, and to check the advance of the mycelium by digging a circular trench at some distance from the affected tree. As the fungus also grows on the decaying bush stump it is necessary to have these removed. *Hymenochaete noxia* is easily recognized by the manner in which the mycelium binds together a mass of sand and small stones to the surface of the roots. The stem disease (*Corticium salmonicolor* B. et Br.) is not uncommon in the Sapele district; trees most commonly attacked at the forks and in consequence the whole or very often dies.

Cacao Diseases. — *Hymenochaete noxia* Berk. is not rare on root and cacao trees. One case of *Fomes semitostus* Berk. was found in the Akoka district, but so far its occurrence on cacao seems to be exceptional. The disease of cacao "canker" may still be regarded as a matter of dispute; it has been ascribed to two different fungi at least: *Phytophthora Faberi* Muhl. and *Spicaria colorans*, an imperfect stage of a *Nectria*. Another fungus which produces effects very similar to "canker" has been found on all parts

plants except the roots and the fruits. This appears to be the most common cacao disease in the Colony and a full description will be published soon as possible. Brown rot due to *Thyridaria tarda* Bancroft, and a disease caused by *Nectria Bainii* Massee have both been noted on the pods. Anthracnose is not uncommon; it may be provisionally attributed to *Colletotrichum theobromicolum* Delacroix.

Cotton Diseases.—Many cotton seedlings were attacked by "sore shin", a disease which does not seem to be due to any specific organism. American cottons are chiefly affected by physiological diseases, such as "red heart" which is characterised by the leaves early in the season turning a bluish purple colour, especially in the spaces between the veins. The leaves soon fall off, their fall being hastened by the presence of fungus. It occurs during periods of excessive rainfall, when the soil is not properly drained, or through failure of rainfall, and the condition was most marked in Agee cotton. In a disease known as "shedding of forms", the plant produces more "forms" than could mature as bolls; the shedding of these effeminate forms, if excessive, is, however, due to unsuitability of soil. A spot of cotton is of obscure origin; it is probably caused by variations in temperature and humidity. The affected leaves are covered with fish brown spots with a dark purple border. In all the cotton districts late mildew is very common; it is produced by a fungus, *Ramularia* *late* Atk., but causes little damage. Other cryptogamic diseases are cotton blight, due to *Colletotrichum Gossypii* South, boll rot caused by a species of *Diplodia* and cotton rust which is widespread and produced by *Puccinia Gossypii* South.

The native cottons are of two distinct varieties, the Meko, a green-seeded variety, and the naked-seeded Ishan variety. Both are subject to "leafcurl", a disease which distorts the leaves, the younger branches and the upper parts of the plant, and restricts flowering. The disease is still under investigation. Another disease almost peculiar to the native cotton and of which the origin is not clear is characterised by a blackening of the midrib and the veins of the leaves and is associated with the presence of numerous bacteria and a *Fusarium*. It was not found on any of the North American cottons, but occurred on Brazilian cotton which bears several botanical characters suggesting a relationship with the native varieties.

— Some Diseases of the Sweet Pea. — TAUBENHAUS, J. J. and MANNS, THOS. F. Dept. of Plant Pathology, Delaware College Experiment Station, Newark, Delaware, U. S. A.) in *The Gardener's Chronicle*, Vol. LIV, No. 1385, pp. 21-25. London, July 12, 1913.

The sweet pea (*Lathyrus odoratus*) is subject to various bacterial and fungal diseases, some of which are described and figured in this article. **The Mosaic Disease.** — This disease is easily recognised by the yellowing or mottling of the leaves. In varieties with thick leaves, this mottling is associated with curling; when the leaves are thin and delicate, they turn yellow and drop prematurely; in very advanced stages, the disease is noticed on the stems.

Infected seedlings often outgrow the disease entirely and make a new growth at a later period. Badly diseased plants often bear flowers but these occur either on very short peduncles or they have curled distorted petals and the colour of the blossom is faded. All varieties, with exception perhaps of the dwarf varieties, are subject to the disease. Other minous plants which suffer from a similar mosaic affection are *Trifolium tense* and several forage species of *Lathyrus*. The mosaic disease of the pea may be induced artificially by inoculation. Under field conditions the green aphids appear to be active agents in the distribution of the malady, while the latter may be reproduced in the laboratory transferring green aphids from infected plants to healthy ones.

Root Rot caused by *Thielavia*.—Chittenden and Massee have suggested the fungus *Thielavia basicola* to be the cause of the streak disease of the stem. This the writer has shown to be of bacterial origin and related to a bacterial disease of the clovers. Plants affected by *T. basicola* have little, or practically no, root system; they remain very dwarfed and are useless for flower production. Healthy seedlings are readily infected by this fungus on the root of plants growing in sterile soil.

Root Rot caused by *Rhizoctonia* (*Corticium vagum*).—This same disease is common to many seedlings, viz. lettuce, tomato, tobacco, and others. Severely infected plants have scarcely any root system; in infected seedlings, only one or two rootlets may be destroyed.

Stem or Collar Rot. — This is due to *Sclerotinia libertiana*; it is usually a seedling disease, though it may attack plants of all ages. The same fungus causes a drop disease of lettuce and of other plants. Stem rot occurs chiefly in poorly ventilated houses, in over-watered, badly drained beds, and in damp places out of doors. The disease spreads very rapidly and is soon fatal. The fungus penetrates the collar of the stem and completely invades the vessel of the plants, thus clogging the upward flow of the water from the roots to the stem. Affected plants first show a wilting of the tip and flagging of the leaves, and finally the seedlings collapse. *bertiana* is a soil organism which occasionally causes root trouble on clover. It is sometimes introduced with animal manure.

Fusarium Wilts or Root Rots. — These are caused by two different fungi which produce the same symptoms, namely a wilt and root rot. Seedlings are affected when they reach the height of about 8 to 10 inches, they wilt and collapse. The bark or cambium is destroyed by the fungus. The rotting seedling becomes a breeding place for flies, which carry the spores to healthy plants; rain and running water also distribute the disease. These species of *Fusarium* are as yet undetermined, but more work on them is in progress.

Root Galls (*Eel worms*). — These swellings are produced by *Heterodera radiciola*. The disease is a common greenhouse trouble, while it attacks roses, violets, carnations, begonias, lettuces, cucumbers and tomatoes. It is not often met with in the field, and is introduced into the greenhouse with infected soil or manure.

Bad Drop or Failure to set Blossoms. — The buds appear on apparently healthy plants, but quickly wither and finally fall. The disease results from the use of a too highly nitrogenous food ration, poor in mineral elements, especially phosphorus and potassium. The writer successfully rolled this trouble within a week by the application of phosphoric acid and sulphate of potash.

Anthraxnose. — A disease due to *Glomerella rufo-maculans* (B.) Speg., which is sometimes manifested in a wilting and dying of the plants at other times the disease spreads downwards and involves the entire plant. On leaves the disease starts as whitish spots which enlarge and involve the whole area. At the time of blossoming the fungus attacks the ovary and sometimes the flower bud as well, and causes them to dry. Infected pods shrivel and are covered with salmon-coloured patches. *rufo-maculans* also causes the bitter rot of the apple and the ripe rot of the pea. Cross-inoculations by Sheldon and Taubenhaus have definitely shown that the fungus can go back from the apple to the sweet pea and vice versa, in each case producing the typical symptoms of the disease. Anthraxnose is of great economic importance. When once introduced into a field the disease spreads rapidly, often destroying the whole crop. It may be raised on young seedlings in the greenhouse. In field conditions the disease appears about July 1; it is carried over winter on cankered limbs and mummified fruit of diseased apples, or on the diseased pods and seeds of the pea, and also in the soil.

Pea Mildew. — This disease is very prevalent on greenhouse peas and on irrigated fields and low land, or where plants are grown thickly. Usually, however, in small garden lots, especially if these are not watered, the disease is practically unimportant, as it is usually mild during the active growing season and becomes more abundant when the plants have served their purpose. Massee attributes the pea mildew in England to *Erysiphe polygoni*. So far, only the conidioid stage has been found in the United States, so that the identity of the fungus there is as yet not definitely established.

Diseases of Raspberry and Loganberry. — Board of Agriculture and Fisheries, *Rept. No. 269*, pp. 3 + fig. London, April 1913.

During recent years the canes of raspberries and loganberries in Great Britain have been observed to suffer to a considerable extent from the disease produced by microscopic parasitic fungi, which are stated to be extending their range of activity. These fungi have been known for more than half a century as parasites on wild roses, brambles, and other woody plants, and their rapid recent extension does not imply any increased power of parasitism, but is simply due to the larger number of susceptible host plants grown in juxtaposition.

Mytilina Rubi Westendorp is responsible for most of the injury caused to raspberries and loganberries. The canes are first attacked, and the attack takes place during the summer.

The first indication of the presence of the parasite is, as a rule, the

appearance of lurid red or purplish patches on the young stem during winter these patches become grey or white owing to the bark having been killed. These dead parts of the bark are then thickly scattered over with the minute black fruits of the fungus, which contain myriads of colourless four-celled spores. When mature these spores escape into the air and then alight on young shoots germinate and enter the tissues, thus ensuring the continuance of the disease in the next season. When several diseased patches are present the canes are killed outright during the winter, while when only one or two affected areas are present, the cane may survive and produce a certain amount of fruit. It is well however, to remove and burn the canes even if slightly attacked, as it is only by such means that the disease can be eradicated. Infection mostly takes place at the period of the year when fruit is present, hence spraying cannot be practised unless the cane is sacrificed, when Bordeaux mixture should be used. Even in these circumstances every diseased cane should be cut down the moment it is observed.

Ascochyia pallor Berk. sometimes occurs as a parasite on the stems of raspberries, roses and brambles. It forms whitish dead patches studded with black dot-like fruits. Treatment should be similar to that suggested in the case of *Hendersonia Rubi*.

1110 - A Disease of Greengage Trees Caused by *Dermatella Prunastri*

— DOWSON, W. J. in *The New Phytologist*, Vol. XII, No 6, pp. 207-216, London, June 1913.

This disease has been observed for some years in the greengage plantations at Willingham and Cottenham near Cambridge. The writer carried out his investigations upon it in the Botany School, Cambridge. The disease attacks branches of all sizes and belonging to old or young trees. Dead branches were easily distinguished from healthy ones by the fact that they were covered with *Pleurococcus* sp. and lichens. The pycnidia and thecia of *Dermatella prunastri* occurred chiefly on the distal end of branches, though sometimes they were observed at the base. Much gum was produced in the diseased wood. The tissues invaded by the mycelium became discoloured and died. The hyphae were most abundant at a short distance behind the junction of discoloured and healthy tissue.

The writer gives the synonyms of the fungus, a detailed description of the latter, together with a description of the disease and the results of field, culture, and inoculation experiments. The results so far may be summarized:

- 1) *Dermatella prunastri* Pers. has been grown in pure culture from canes and from ascospores.
- 2) The mycelia arising from both these kinds of spores when growing on nutrient agar and sterilised pieces of greengage wood bark, produced pycnidia after some three weeks' growth.
- 3) The mycelium was found present in all the tissues of the host and particularly in the wood and pith.
- 4) The vessels, tracheids and fibres are not delignified, and the hyphae pass from one cell to another by way of the pits.
- 5) The

advancing up a branch is preceded by gumming in the woody elements. 6) The inoculations of healthy greengage trees with the mycelium of *Dermatella prunastri* led to infection.

11 - *Peridermium Laricis* a Parasite of *Larix europaea* in Scotland. — BOUTWICK, A. W., and WILSON, MALCOLM in *Transactions of the Royal Scottish Arboricultural Society*, Vol. XXVII, Part II, pp. 198-202 + fig. Edinburgh, July 1913.

The writers found upon some leaves of larch (*Larix europaea*) sent from Inverness-shire a fungus which, although not agreeing in all respects with *Aecidium* (*Peridermium*) *Laricis* described by Klebahn (Schr. f. Pflanzenkr., Bd. IX, 1899, p. 14), differed too slightly from the latter to justify the creation of a new species.

The parasite appeared early in the season and was fully developed on leaves when they were about three weeks old; the branches shed their diseased leaves at the end of July. The fungus was almost always found on the under surface of the leaves but occasionally it occurred on the upper side.

Coeoma Laricis bears a considerable resemblance to the form just described as occurring on the larch; it is however at once distinguished from *Peridermium Laricis* by the entire absence of the pseudoperidium, as well as by differences in the sculpturing of the spore wall. *Coeoma Laricis* has been shown to be the aecidial stage of six different species of *Melampsora* in which the uredospore and teleutospore stages occur on various species of *Populus* and *Salix*. Klebahn, by infection experiments commenced in 1906 in the neighbourhood of Hamburg, proved that *Peridermium Laricis* is the aecidial condition of the cryptogam then called *Melampsora betulina*, for which he proposed the name *Melampsoridium betulinum*, establishing the difference between the two genera as follows:

Melampsoridium: aecidium of the *Peridermium* type, uredospore sorus with a definite pseudoperidium.

Melampsora: aecidium of the *Coeoma* type, uredospore sorus surrounded by capitate hairs, but without a definite pseudoperidium.

Saccardo (*Sylloge Fungorum* XXI) records the presence of *Peridermium Laricis* in France and Germany; Arthur and Kern include it in their list of North American species, for *Melampsoridium betulinum* is common in North America, but the stage on the larch has not yet been found in that country. Considering the abundance of *Melampsoridium betulinum* in Scotland it is a remarkable fact that *Peridermium Laricis* is of such rare occurrence. The resemblance to *Coeoma Laricis* may however partly explain the absence from previous records. It is possible that *Melampsoridium betulinum* really consists of several physiological species and that *Peridermium Laricis* is only one of its aecidial forms; this supposition may explain the absence of records from North America.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

- 1112 - Broom as one of the Chief Centres of Distribution of Dodder in Mountainous Districts. — MODONESI, M. in *Il Coltivatore*, Year XIX, No. 1 pp. 569-571, 1 fig. Casalmonteferrato, June 3, 1913.

The writer, basing his observations on his personal experience, draws attention to the fact that the solitary broom bushes which grow on the steepest slopes, often act as hosts of dodder, thus disseminating the pest on the adjacent plain. He advises careful watching and the burning of infected bushes.

INSECT PESTS.

- 1113 - Insect Pests and Cryptogamic Diseases observed in the Barbados and West Indies, during 1911-12. — Imperial Department of Agriculture for the West Indies, Report on the Botanic Station, Montserrat, 1911-12, pp. 16-17. Barbados, 1911.

Insect Pests. Maize is liable to few fungoid pests, but is invariably attacked by the "corn ear worm" (the larva of *Laphygma frugiperda*). The eggs are laid on the grown up plants; the larvae attack first the leaves and later the stem of the plant. The first indications of the presence of the parasite are shown in the changes taking place in the young unfolded leaves.

Experiments have been tried with Paris green in powder and solution alone and mixed with lime, but owing to the scorching of the leaves it is of no use. Arsenate of lead has proved the most effective insecticide in this pest. It cannot be applied alone as it scorches the foliage, but mixed with four times its weight of lime or used as a solution in water (1 in 100). The latter method, however, is not so effective.

Paris green has also been effective in dealing with the attacks of the "Bengal bean caterpillar" (*Thermesia gemmatilis*) on *Mucuna utilis*. When applied as a mixture with six times its weight of lime it is liable to produce scorching of the leaves, but not defoliation. Arsenate of lead in similar proportions has no injurious effects.

On the Cotton plant, *Dysdercus andreae* and *D. delanoyi* have occurred and caused considerable destruction in the plantation during 1911.

The "cotton flower bud maggot", which attacks cotton in Antigua, has been definitely identified as being *Contarinia gossypii*.

Towards the end of 1911, the "Chaff scale" (*Parlatoria pergandi*) was discovered attacking Citrus plants at Grove station, and as it has not been observed outside the station it would appear to be a recent introduction.

The chief insect attacking the coconut in this island appears to be the Bourbon scale (*Aspidiotus destructor*), which is common on the leaves but cannot be regarded, as a serious pest.

Fungus diseases. Ground Nut Rust (*Uredo arachidis*). Further experiments were tried with 5 varieties divided into two series, one half sprayed with Bordeaux mixture on two occasions. The first application was 27 days after planting before the pustules had appeared, and the second 32 days later (Sept. 19) when the fructifications had begun to appear. The varieties were attacked, but less disease developed on the sprayed ones. The effect of the spraying on the yield of nuts is given below.

Variety	Yield in lbs.	
	Sprayed	Unsprayed
a Running	145	126
a Running (Small seeded)	81	93 ½
a	108	122
a (3 seeded)	114	115
b	84	58 ½

As the results are not consistent, it has not been demonstrated that fungus was in past years responsible for a shortened crop, or that it affected the quality of the nuts in any way.

Cotton Boll Soft Rot. — The mycologist suggests that a species of *Aspergillus* or *Phytophthora* is the probable cause.

It is particularly prevalent in damp seasons and damp localities, and causes considerable losses.

The Argentine Ant (*Iridomyrmex humilis* Mayr.). — NEWELL, WILSON and BARBER, T. C. — U. S. Department of Agriculture, Bureau of Entomology, Bulletin No. 122, pp. 98 + XIII plates + 13 figs. Washington, June 26, 1913.

The Argentine Ant is the most injurious of the Formicidae in the United States and the writers believe that its depredations will extend as far as California and the Gulf States. This paper gives the results of 5 experiments at Baton Rouge, La., and at New Orleans.

I. humilis was first noticed at New Orleans in 1891 and has spread with great rapidity until it is now the foremost household pest and extends its ravages to the majority of crops grown in the South.

It is indigenous to the Argentine and Brazil and was accidentally introduced into Madeira, where it exterminated another ant (*Pheidole megacephala*), which was itself an introduced species, and had exterminated the Argentine ant before it. Its occurrence has been recorded in Portugal, Capetown, Chile. It has thus established itself as a nuisance in four continents, owing to its dissemination through the ordinary channels of commerce, and is reasonable to expect that it will eventually invade all the semitropical countries of the globe. There is every reason to believe that it was intro-

duced into New Orleans by the coffee ships from Brazil and that it has spread by means of the railroads and driftwood. It is not definitely known at what altitude this insect is unable to thrive, but it is safe to assume that it could not extend its ravages beyond the minimum isotherm of zero.

Under natural conditions the rate of dispersal of these ants is very slow, some few hundred yards a year, but when food is plentiful (such as secretions of aphides or scale insects) nothing short of running water will stop them.

Of the means of dispersal there is no doubt that floating drift wood and the transportation of freight are the most important, and that the pupal flight of the queens takes no part at all, owing to their inability to rear the grubs.

Up to the present it has attracted most attention as a household pest. During the rainy season, or when their natural diet is scarce, they invade the houses in myriads and almost drive the occupants to distraction.

The damage to plant life is due chiefly to the protective care which they bestow on scale insects and plant lice, and to their attacks on blossoms in pursuit of nectar. Owing to its fondness for the sugar cane mealy bug (*Pseudococcus calceolariae*) it is almost impossible to check the ravages this bug where the ant is present.

In cotton plantations and corn fields the occurrence of this ant is responsible for large increase in the swarms of aphides and lice.

It is a veritable plague among honey bees and poultry, so that beekeeping and chicken rearing become impossible.

The only substance that has been found to protect sitting hens is zinc oleum powder, liberally sprinkled in the nest and among the hen's feathers from time to time during the brooding period.

Another form of injury is due to the destruction of beneficial native species of ants, such as the "fire ant" (*Solenopsis geminata*) which destroys larvae of boll weevils. Lastly, it may also be an important agent in the spread of disease in unsanitary districts.

The only activities of this ant that can be considered at all beneficial are concerned with the destruction of bed bugs, "chiggers" or so-called "bugs" and the sorghum midge.

The writers give detailed descriptions of the species, methods of study, life history, colonies, habits, accounts of the symbiosis with other insects and the methods of their attack and repression.

Eggs are laid at all seasons of the year, but chiefly in summer. A queen was observed to deposit eggs at the rate of 30 per day, but suspended oviposition for several days at a time. The period of incubation varies from 12 to 55 days according to the temperature, the duration of the larval stage from 11 to 61 days. The pupal stage varies according to the temperature, males requiring from 19 1/2 to 28 days, workers from 12 1/2 to 25 days, and the queens 3 or 4 weeks. Thus it requires from 33 to 141 days, or an average of 74 days, for the complete development of an individual.

Of the three adult forms, the worker is the smallest (from 2.25 to 2.75 mm.) and lives from 10 to 12 months. The male varies in size from 3 to 3 mm., is winged and lives in the spring or (in limited number) in the autumn. The queen measures from 4.5 to 6 mm. and lives for several years. She is winged before fertilisation, but loses the wings afterwards.

The ants facilitate the multiplication of scale insects and aphides by constructing shelters of earth to protect them against adverse atmospheric conditions and parasites.

An invasion of these ants into a plantation is always accompanied by renewal of the attacks of scale insects in sugar cane plantations and oranges. The species of aphides and scale insects most favoured by these ants are given in the following list.

- bamboos: *Asterolecanium bambusae* Bdv., *Odonaspis secreta* Ckll., *Odonaspis inusitata* Green.
- banana: *Coccus hesperidum* L., *Chrysomphalus aonidium* L.
- cotton: *Aphis gossypii* Glov.
- corn: Undetermined aphid (probably *Aphis maydis* Fitch).
- figs: *Pseudococcus citri* Risso, *Lecaniodiaspis* sp., *Aspidiotus camelliae* Sign.
- hackberry, elm, hackberry and various shade trees: *Pseudococcus* sp., *Ceroplastes cirripediformis* Comst., *Ceroplastes floridensis* Comst., *Chionaspis longiloba* Cooley, *Chionaspis americana* Johnson.
- magnolias: *Neolecanium cornuparvum* Thro., *Aspidiotus camelliae* Sign., *Toumeyella turgida* Ckll.
- mulberries: *Chrysomphalus tenebriosus* Comst.
- oaks: *Kermes galliformis* Riley, *Eulecanium caryae* Fitch., *Eulecanium quercifex* Fitch., various aphidids.
- orange: *Coccus hesperidum* L., *Parlatoria pergandii* Comst., *Lepidosaphes beckii* Newm., *Lepidosaphes gloverii* Pack., *Chrysomphalus aonidium* L., *Aphis gossypii* Glov., also the white fly, *Aleyrodes citri* R. and H.
- palms and other ornamentals: *Coccus hesperidum* L., *Eucalymnatus tassellatus* Sign., *Aspidiotus lalaniae* Sign., *Aspidiotus hederæ* Vall., *Chrysomphalus dictyospermi* Merg.
- peach, pear, and other fruits: *Aspidiotus perniciosus* Comst., *Aulacaspis pentagona* Targ., various aphidids.
- persimmons: *Ceroplastes cirripediformis* Comst., *Eulecanium corni* Bouché, *Pulvinaria vitis* L.
- strawberry: *Aphis forbesi* Weed.
- sugar cane: *Pseudococcus calceolariae* Mask., *Aphis gossypii* Glov.
- sweet gum: *Cryptophyllaspis liquidambaris* Kotinsky.
- various shrubs: *Coccus hesperidum* L., *Saissetia oleae* Bern., *Pulvinaria cupanæ* Ckll., *Aspidiotus lalanæ* Sign., *Chrysomphalus aonidium* L.
- willows: *Eulecanium nigrofasciatum* Perg., *Pseudococcus* sp., (near *citri*), *Chionaspis salicis-nigræ* Walsh, *Aspidiotus perniciosus* Comst., various undetermined aphidids.

An interesting factor concerned with the remarkable increase of scales and aphids which invariably accompanies infestation by this ant is the persistence with which the ants drive away the ladybirds which attempt to prey on the insects fostered by them and it is extremely rare that a ladybird is found at all on the infested trees.

The Argentine ant is destructive of nearly all other forms of insect life, the insect which it is able to hold in its jaws being suitable prey.

The natural enemies of this ant are remarkably few. Their destruction has been recorded by cockroaches (*Thysocera cinela*), spiders (*Theridion tepidarium*), birds (English sparrow and yellow hammer) and parasitic mites (*Pediculoides ventricosus*), but none of these are sufficiently effective to be of any economic importance. Experiments in the cryptogamic parasites (*Sporotrichum globuliferum*, *Bacillus larvae*) have also given negative results.

Methods of repression. — The only effective methods are those based on the actual destruction of the ants themselves, and these efforts must be directed against the queen ants as the progenitors of the race. As never more than 10 per cent. of the workers are required for foraging, their destruction does not seriously affect the rate of increase of the colony. Repellents are only of use in protecting food stuffs. As the result of numerous experiments, the use of running water and zenoleum powder have been found most effective. Coal-tar, pine-tar, tobacco dust and sulphur were found to be ineffective. Crude petroleum of all liquids was found to be most repellent. "Ant tape" soaked in corrosive sublimate is very effective in isolating tables and furniture generally. Cyanide used either as solution or fumigant was useless, but injections of carbon bisulphide gave good results. The writers also experimented with poisoned foods in the hope of finding a substance that would be included in the diet of the colony. A paste of 1 part arsenate of lead and 2 parts honey, and a solution of 0.25 gm. white arsenic and 20 grams sugar in 100 c. c. of water proved effective in destroying portions of the colony and in driving the remainder away from the vicinity.

Various devices have been constructed for preventing the invasion of beehives by this pest, but on a commercial scale the cost is so prohibitive that the wisest course is to remove the apiary to an uninfected locality.

In orangeries "ant ditches" are constructed and supplied by pump. Divided bridges with a 2 inch cleft through the middle are used to prevent the passage of the ants.

Flooding the ground and driving the ants to certain restricted areas has been successfully resorted to.

Winter trap boxes containing decaying vegetable matter are useful in collecting the colonies in winter, but clean surface weeding is essential in trapping all the colonies. Carbon bisulphide is used to destroy the colonies in the boxes.

A bibliography of 4 works is appended.

1115 — **Rice Water Weevil (*Lissorhoptus simplex*).** — TUCKER, E. S. (Associate Entomologist, Louisiana Agricultural Experiment Station, Baton Rouge) in *The Rice Journal and Southern Farmer*, Vol. XVI, No. 7, p. 2. Crowley, Louisiana, July 1919.

This insect is the most serious pest of the rice crops in the Southern States. The adult appears only at night and is attracted in swarms to a bright light.

The writer has found dead specimens in Honduras rice and concludes that the weevils are not a menace to stored grain, but that they seek refuge on the sheaves of harvested rice in the field and find their way through

the thresher with the grains. He has found as many as 3 dead weevils in a sample of rice weighing 15 ounces, and the stock was of the previous season's harvest.

16 - Observations on *Pseudococcus bakeri* Essig ("The Walnut Mealy Bug"). — VAILE, R. S. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, p. 554. Sacramento, California, June 1913.

In December 1910 Essig described a new species of mealy bug and identified it as *Pseudococcus bakeri*. Since then he has observed the following host plants: walnut, apple, pear, orange, lemon, pomelo, elder, cottonwood, black walnut, nightshade and a few ornamental shrubs. On the elder and nightshade it appears to live primarily on the roots, and numerous laureum bushes have been found with the roots thickly covered with all stages from eggs to mature adults. This is also true of elder, but it has not been observed on the roots of citrus or other fruit trees.

The life history appears to be much the same as that of *P. citri*, except that the egg masses are much looser and the number of eggs laid by a female is less.

The average number of eggs per mass of *P. citri* is 274, whilst that of *P. bakeri* is about 67. Considering the lower fertility of the eggs of *P. bakeri* (10 to 20 % infertile) it does not seem probable that it will ever be regarded as a damaging insect, and it seems to require no additional control measure. The writer suspects the presence of egg parasites, though up to the present it has not been demonstrated.

Carbolic acid emulsion and other sprays are effective against both species of *Pseudococcus*; fumigation is more efficient against *P. bakeri* than against *P. citri*.

17 - Sweet-Corn as a Culture-Trap for *Heliothis obsoleta* Hübn. ("Cornworm"). — COOK, A. J. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, p. 555. Sacramento, California, June 1913.

Known variously as the "corn worm", "corn ear worm", "tomato worm" and "cotton boll worm", it has a decided preference for sweet-corn. This fact may be of great use to the tomato grower, for by planting a row of corn in place of every tenth row of tomatoes the moth is attracted to the less inviting tomato plants. Dusting or spraying with lead arsenate will save the corn; on a small scale it may be saved by hand picking.

18 - Arsenate of Lead as an Insecticide against the Tobacco Hornworms. — MORGAN, A. C. and PARMAN, D. C. — U. S. Dept. of Agriculture, Bureau of Entomology, Circular No. 173, pp. 10. Washington, 1913.

The results of 5 years' experiments conducted by the Bureau of Entomology in Tennessee, Kentucky and adjoining States. The former method of rootworming having become too expensive has been replaced by the use of arsenate of lead as an insecticide. Paris green has been tried, but owing to damage by scorching of leaves and weakening of the leaf-stalk its use is to be abandoned. Arsenate of lead can be applied at any stage of growth, does not damage injured leaves and causes no irritation to the plant.

In applying arsenate of lead to tobacco plants it is necessary to mix it with some carrier to ensure even and thorough distribution. The best carrier for this purpose has been found to be finely sifted freshly burnt wood ashes, an equal bulk of the ashes being used.

The arsenate should be of the di-plumbic form, as it contains a great percentage of arsenic acid. The applications should be made when the dust is on the plants. For young plants an application of $3\frac{1}{2}$ lbs of arsenate of lead per acre is sufficient, whilst full-grown plants require not less than 5 lbs. per acre. If spraying is adopted, a solution of 3 to 4 lbs. of arsenate in 100 gallons of water is required.

1119 - Insects injurious to Cotton in Burma. — SHROFF, K. D. — *Department of Agriculture, Burma, Bulletin No. 8, 1912*, pp. 40 + 15 plates, Rangoon, 1913.

All efforts to introduce superior types of foreign cotton have hitherto proved abortive, and no variety is reported to have become established. At Mandalay almost all the plots of exotic cottons were found to be heavily infested by beds of destructive insects. Local varieties suffer periodically from attacks of aphids (*Pya*), chafers (*Podigaung*), and crickets (*Payit*), especially when young, but as a rule the plants are healthy and free from disease.

The following list contains the varieties observed at the experimenter's station at Mandalay and during a tour of inspection in the cotton districts of Sagaing, Lower Chindwin and Myingyan (1908). The writer gives for each variety the indigenous name, a detailed description to accompany the figures, and the methods of combatting the pests.

<i>Earias fabia</i> Stoll., <i>E. insulana</i> Boisd.	(« The Spotted Boll Worm ») (1).
<i>Gelechia gossypiella</i> Saund.	(« The Pink Boll Worm ») (1).
<i>Sylepta derogata</i> Fabr.	(« The Cotton Leaf Roller ») (1).
<i>Diacrisia obliqua</i> Wlk.	(« The Hairy Caterpillar ») (2) (3).
<i>Dysdercus cingulatus</i> Fabr.	(« The Red Bug ») (1).
<i>Oryctolagus laevis</i> Kirby.	(« The Dusky Bug ») (1).
<i>Aphis gossypii</i> Glov.?	(« The Aphid ») (1).
Fam. <i>Jassidae</i> .	(« The Leaf Hopper ») (1).
<i>Cerococcus hibisci</i> Green.	(« The Brown Coccid ») (1).
Two species not identified.	(« The Mealy Bugs ») (2).
<i>Acridum arundinum</i> Burm.	(« The Black Spotted Grasshopper »)
<i>Brachytripes achalatus</i> Stoll and Lio-	
<i>gryllus bimaculatus</i> De G.	(« Field Crickets ») (2).
Species not identified.	(« Chafer Grub ») (3).
<i>Zenusa</i> sp. and <i>Aleides</i> sp.	(« Borers ») (3).

- (1) Attacks indigenous as well as exotic cotton, but causes more damage to the latter.
 (2) Attacks several plants, amongst them, cotton.
 (3) Do not cause serious damage.

1120 - The Spotted Beet Webworm (*Hymenia perspectalis* Hübner) CHITTENDEN, F. H. — U. S. Department of Agriculture, Bureau of Entomology, *Bull. No. 127, Part I*, pp. 11 + figs. Washington, May 31, 1913.

The author recorded the spotted beet worm in the District of Columbia in 1905 and again in 1912 without the insect having made an appearance.

interval. In 1912 it caused great damage to the sugar beets and various ornamental plants in gardens and glass houses. It is probably of African origin, and though not known in Europe it will probably time become cosmopolitan. As a pest it has been observed only at Brooklyn, N. Y., and Washington, D. C.

The larvae are nocturnal in habits and conceal themselves about the bases of the plants near the roots and under portions of leaves or petioles resting on the ground. When full grown they are green in colour and about 1 mm. in length. Before pupating they turn pale and yellowish. The cocoon is formed on the plant or on the ground, and is covered with more or less webbing with occasionally a black excrement.

The larvae have been found on ornamental plants such as *Telanthera spectabilis* and *Androsace lindeni*.

It has been found associated with other insects, namely the yellow-striped flea beetle (*Disonychia mellicollis* Say), the spinach flea beetle (*Disonychia anthemeloena* Dalen) and the Hawaiian beet webworm (*Hymenia fascialis* Swm.). Amongst the natural enemies of this pest are the larvae of the spined soldier bug " (*Podisus maculiventris* Say) and a small braconid (*emiteles* sp.).

The closely related species, *Hymenia fascialis*, has several parasites, and is very probable that further study and observation will find other natural enemies. As a check on the spread of this pest, spraying with Paris green at the rate of 2 lbs. in 100 gals. of water or a mixture of nicotine sulphate 1 oz., whale oil soap 4 oz. in 4 gallons of water is recommended. Early hatching in the autumn and a rotation of crops resistant to its attack would be practised.

1 - "The Striped Beet Caterpillar" (*Mamestra trifolii*). — MARSH, H. O. U. S. Department of Agriculture, Bureau of Entomology, Bulletin No. 127, Part II, pp. 18 + figs. Washington, 1913.

The writer has observed this insect in the Arkansas valley during portions of four years, occurring on sugar beets and lambsquarter (*Chenopodium album*).

The larvae attack the leaves, causing defoliation, from which the plants recover provided the crowns have not been attacked. Three generations have been noticed in the Arkansas valley. The moths make their first appearance in May and deposit eggs, producing a generation in the first half of July. The July generation produces eggs which become moths at the end of August and the third generation larvae mature late, producing pupae which live through the winter in the soil. A single female produces about 500 eggs.

Preventive measures. — Cultivation of the land after harvest breaks up the cells and exposes the pupae to injury from weather and other causes.

There are several predaceous insects which feed on *Mamestra* larvae, *Microgaster inedius* Cress., *Meteorus* sp., *Phorocera claripennis* Macq., *Meloides bioculata* Fab., and *Phidippus coloradensis* Thorell.

Spraying experiments have been conducted and Paris green proved most effective. The following formula is recommended:

Paris green	3 lbs.
Whale oil soap	6 lbs.
Water	100 gallons.

This should be applied with a field sprayer at the rate of 75 to 100 tons per acre.

1122 - **The Red Spider on Hops in the Sacramento Valley, California.** - PAUL WILLIAM B., - U. S. Dept. of Agriculture, Bureau of Entomology, Bulletin No. pp. 41 + figs. Washington, May 1913.

This is an account of 18 months' observation and experiment on red spider (*Tetranychus bimaculatus* Harvey) in the hop districts of Sacramento valley.

Life history - The eggs are deposited singly and loosely amongst webs and upon the underside of the leaves. From 10 to 450 may be found on a single leaf. The period of incubation varies from $4\frac{1}{2}$ to 10, according to the state of the weather, and the period of maturity from 10 to 16 days. Sexual differentiation takes place after the second moult, copulation does not take place until after the third. Parthenogenesis has been observed to take place, the bulk of such offspring being males.

The mites live on the underside of the leaves protected by their webs and gradually migrate from the lower leaves as they become damaged to the higher portions of the vines. They do not hibernate on their hosts but upon violets, mallow (*Malva passiflora*) and morning glory (*Ipomoea*).

Experiments showed that the average female mite can travel 211 ft. of leaf surface in 10 hours and from 10 to 60 ft. over soil according to the texture. The writer has observed this mite to be almost voracious with regard to its host plants, and gives a list of 43 greenhouse ornamental plants, 41 field plants, shrubs and trees, and 19 herbaceous plants occurring near hopfields, all of which this mite has been found to attack. From the wide range of plants in this list it seems probable that this mite is able to thrive on any form of vegetation in which the pubescence on the underside of the leaves is not so heavy or luxuriant as to prevent attack on the leaf tissue.

The first symptoms of attack are the appearance of yellow spots on the leaves. As the mites increase in number the leaves become more "singed", turn yellowish, dry up and fall to the ground. The decrease in vitality of the vine results in a premature ripening of the hops, decreased yield, and weakening of the roots. The male vines appear to suffer more severely than the female and are sometimes entirely destroyed.

Several insects have been observed preying upon the red spider but not in sufficient number to have much effect on the infestation. The most numerous insect was a small anthocorid bug (*Triphleps tristis* White). Certain small ladybirds have also been observed.

For preventive measure the writer has found that the cheapest and most efficient insecticide is flour paste (8-100) or a combination of lime-sulphur (1-100) and flour paste (4-100). It is essential that the vines be thoroughly sprayed. These mites are not affected by any form of dry sulphur. Stripping the vines and burning the leaves is an excellent measure, but not reliable as a complete control. When the mites have reached the point of stripping, spraying operation should be commenced immediately after stripping. A second spraying is also necessary 7 or 8 days later.

The cost of spraying the different liquids with a machine of 2 acres per day capacity works out as follows:

	Cost per acre
Stripping the vines	8s to 9s
Spraying twice, each 300 gallons, with flourpaste (8%) . . .	32s
Spraying twice, each 500 gallons	34s
Spraying twice, each 300 gallons, with mixture of lime sulphur (10%) and flourpaste (4%)	33s
Spraying twice with same mixture, using 500 gallons . . .	37s

Experiments with flour paste (8 1/2 to 10 %) show that it is very effective in fixing the mites to the leaves, but as it has no effect on the eggs and an application is necessary. It is also quite harmless to the foliage and blossoms and does not interfere with the fertilisation of the cones.

It is useful against all attacks of red spider except on sweet peas, carnations, green house roses and plants having a heavy pubescence on the leaves.

The leaves of carnations and greenhouse roses are too smooth for the flour paste to adhere and the old method of washing with the garden hose remains the best method in this case.

Appended is a bibliography of 27 works.

11 - A New Fruit and Truck Crop Pest (*Irbisia brachycerus* Uhler). - OSBORN, E. J. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II. No. 6, pp. 551-553. Sacramento, California, June 1913.

This pest was reported as a small black plant bug damaging the fruit of trees and garden crops generally. Weeds of uncultivated land and garden vegetables, especially radishes and rhubarb, were found attacked. The absence of eggs and immature stages led to the conclusion that the insects had emigrated in search of food from other host plants that had been destroyed.

Owing to the large area of distribution, contact poisons would be used and the writer recommended a good repellent such as Bordeaux mixture instead of an insecticide.

This capsid pest has been identified by Van Duzee as *Irbisia brachycerus* Uhler, which was redescribed as *Capsus solani* by Heideman.

1124 - The Occurrence of Woolly Aphis (*Schizoneura lanigera*) in the Co of Apples. — HEWITT, THOMAS R. in *Journal of Economic Biology*, Vol. 8, No. pp. 95-98 + 1 fig. London, July 1913.

In January the writer had occasion to examine some apples ("Newo Pippin") received from California by a Dublin fruit merchant. The was no external symptom of disease except for a slight mildewy appearance of the eye, but on cutting them in two, the cores were found to contain aphids which in three cases were alive. There was little damage done to the fruit, beyond a small channel connecting the eye with the core, one apple the seeds were damaged, but in no case was the flesh injured.

The generation of the species in the *Schizoneura* is carried on chief by parthenogenetic females which hibernate on roots or in cracks in the bark during the winter months.

The specimens found in the imported apples were found to be adult females and larvae in different stages of development. This occurrence of the fruits is thus of considerable economic importance, for the importation of such infested apples affords the aphid an opportunity of gaining entrance and establishing itself in fresh orchards in this country.

Another means of hibernation has been shown by E. M. Patch, who has proved that *S. americana* of the elm and *S. lanigera* of the apple are identical. She claims that the woolly aphid of the apple hibernates in the rough bark of the elm, which is the normal host plant of the sexual brood. Eggs are laid in the elm bark and give rise to virgin "stem mother" which give birth to a second generation of wingless females. The spring of these are the third generation, which acquire wings and migrate in the spring.

It is evident that the occurrence of a sexual brood in the apple is common, but there is considerable uncertainty as to the identity of *ulmi* and *S. americana*. It would be interesting to know what genetic relationship exists between *S. ulmi* and *S. lanigera*, and if the migration which is known to take place in summer is to the elm or to other apple trees generally believed.

1125 - Collembola damaging Pine Trees. — COLLINGS, W. E. in *Journal of Economic Biology*, Vol. 8, No. 2, p. 99. London, July 1, 1913.

Several species of Collembola have been known to be injurious to various species of roots and flowering plants and to act as carriers of fungous spores.

The writer has recently examined some diseased shoots of *Pinus vestris* and found that the damaged buds contained 5 or 6 specimens of Collembolan which Prof. Carpenter identified as *Seira nigromaculata*.

The insect appears to be attracted by a resinous gum, and as the bud opens, makes its way to the bases of the young leaves, causing the leaves to turn yellow and ultimately fall away. Sometimes the damage is partial, but mostly the new buds are completely ruined.

As a preventative the scattering of naphthaline round the base of the stem, or smearing with a sticky material in the autumn is recommended.

